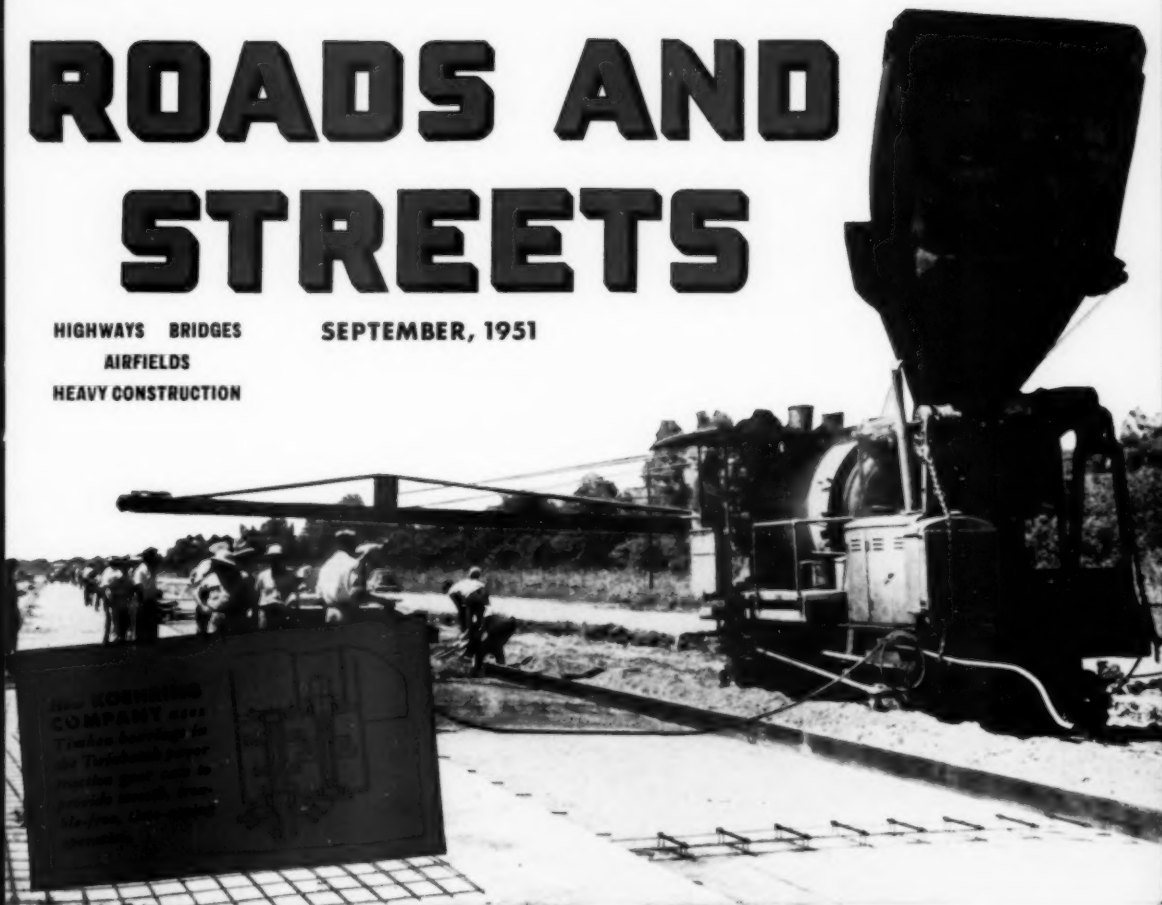


# ROADS AND STREETS

HIGHWAYS BRIDGES  
AIRFIELDS  
HEAVY CONSTRUCTION

SEPTEMBER, 1951



## TIMKEN® bearings keep Twinbatch® paver working on the double

**T**HE Koehring Twinbatch paver shown above is especially designed for fast road work. It mixes, places and pours the concrete. To assure fast, smooth operation, prevent breakdowns and provide long life, the designers mounted vital moving parts on Timken® tapered roller bearings.

Timken bearings are used on the power shaft, drum roller, drum drive shaft, drum pinion, traction spline shaft, sliding gear, sliding gear shaft and hoist pinion.

Timken bearings take the heavy loads from any direction—radial, thrust and combination—because of their tapered construction. Line contact between rollers and races gives them extra load-carrying capacity. True rolling motion and extremely smooth surface finish combine to practically eliminate friction. In addition, Timken bearings make tighter closures possible, which retain lubricant better, keep dirt out.

As a result, moving parts stay in positive alignment. Deflection and end-play are minimized. Parts operate better, last longer. Friction is reduced to a negligible amount.

Maintenance man-hours and down-time are cut to the bone.

Make sure that every piece of road-building machinery you make or use is Timken bearing equipped. Look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

**TIMKEN**  
TRADE-MARK REG. U. S. PAT. OFF.  
**TAPERED ROLLER BEARINGS**



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EJECTION TIME . . . . 12 SECONDS

LOOK at this record . . . exceptional even for LaPlant-Choate Motor Scrapers! Production like this in tough, rubbery clay! It shows what big, powerful TS-300's can do in the toughest jobs. It proves that LPC Motor Scrapers have *everything* a real earthmover needs for rough going . . . power, speed, capacity, stamina, many other advantages combined for high production and low earthmoving cost.

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Fast, clean ejection of this tough, rubbery material demands the 8'9" apron opening found only on TS-300 Motor Scrapers.

When you need equipment that's built to beat the roughest conditions, call on your LaPlant-Choate distributor first.



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**MOTOR SCRAPER**  
PERFORMANCE

H. L. Butler & Son of Dallas is an outfit that's moved lots of dirt . . . made money on tough ones like this White Rock Sewage Plant job for the City of Dallas. They know what good equipment means . . . that's why they own three LPC TS-300 Motor Scrapers.



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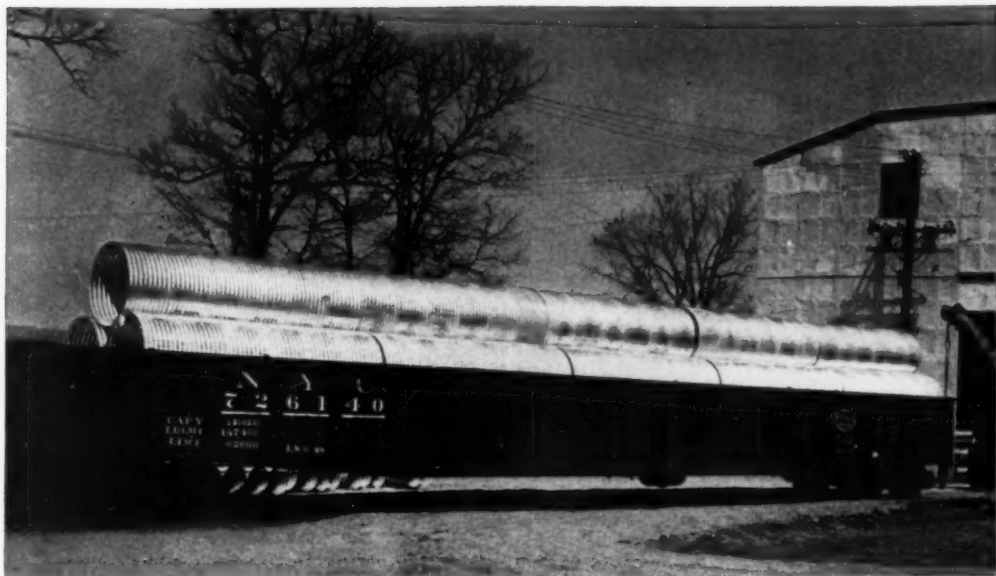


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# ROADS AND STREETS

September, 1951 • Vol. 94 • No. 9

Roads and Streets represents 59 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher



HALBERT P. GILLETTE, Editor-in-Chief

H. J. CONWAY, Assistant Publisher

## Coming Articles

### How 40-ton Compactors Helped Consolidate Big Road Fill

Guy F. Atkinson's job near Los Gatos, California, will be described. The state engineers decreed a million-yard fill across a reservoir's edge, and specified the big rollers to insure maximum densities.

### How Youngstown Dug out of the Big Thanksgiving Blizzard

Commissioner James Ryan of this Ohio City gives a vivid account of the "super blizzard" of a year ago, tells what his organization did to keep the city moving.

### Designing an Arterial Road for Very Heavy Traffic

A West Virginia engineer gives us an exceptionally thorough account of the procedures used in soils studies, field tests of subgrade, thickness design for expected traffic, analysis of traffic from a pavement design standpoint. The resulting 17-in.-thick flexible pavement, base and subbase system is described.

### How Did the Contractors Do on the New Jersey Turnpike?

The much-publicized close tolerances set up for pavement construction proved to be no particular trouble, but many interesting experiences were gained during the record-breaking summer's work just passed. See another Roads and Streets feature on this \$240 million project.

### What One Engineer Thinks of Sawing Concrete Road Joints

Kansas state experience in use of power saws for cutting road joints will be described. A tip: the author's all for the sawing method. See forthcoming article.

### Also Coming Along

How a road bridge was raised above flood level at Portsmouth . . . Nebraska's research to eliminate map cracking in concrete pavement (and recent use of fly ash in mix) . . . Residential street paving methods in a middle-western city . . . An Ohio concrete road job sets state record (and demonstrates new ideas for controlling traffic past the work) . . . Soil-cement methods in improving Peoria streets . . . More articles coming on methods of conserving and maintaining your equipment.

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C. T. Murray, Managing Editor  
Col. V. J. Brown, Associate Editor  
W. W. VanStone, Production Editor

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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## These tires give less trouble —more recaps!

**T**HE ARISS-KNAPP COMPANY of Oakland, California, is engaged in excavating and hauling dirt, rock and gravel in the San Francisco Bay area. They operate 5 semi-dump trucks, 9 regular dump trucks, 2 motor graders and 1 tractor-low-bed trailer. Hauling heavy loads over dirt, gravel, rock and a mixture of all types of roads, the drive wheels of these trucks are all equipped with B. F. Goodrich tires.

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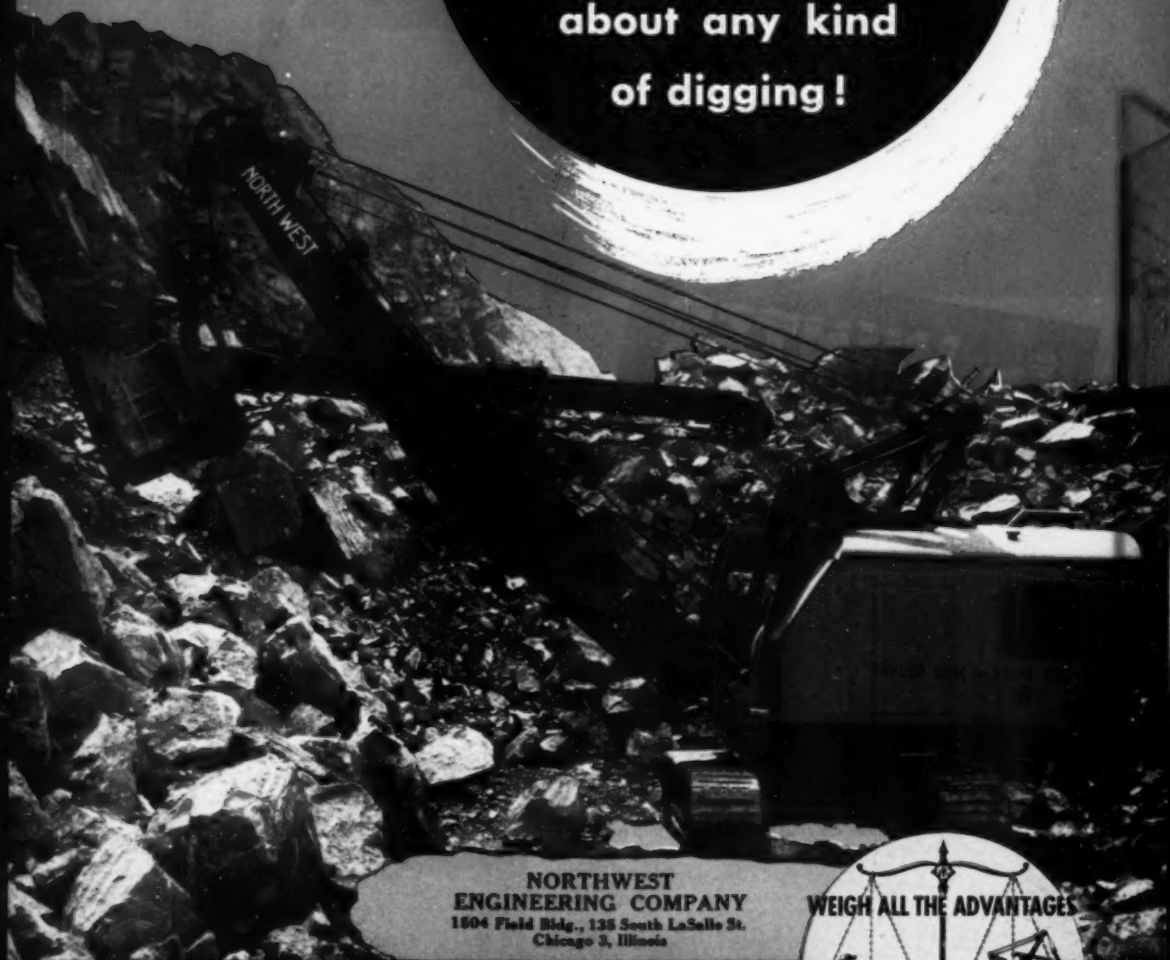


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# Griggs County

## D TOURNAPULL



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**in WINTER**  
... plows, removes snow

When last winter's first blizzard hit Cooperstown, North Dakota, Griggs County Soil Conservation District equipped their high-speed, rubber-tired D Roadster Tournapull with a LeTourneau electric-control, V-type Snow Plow. The Roadster was put to work immediately plowing out city streets, and later moved into the country on call from marooned farmers to open secondary roads and farm lanes. Temperatures reached 20° below zero ... drifts were 2 to 6 ft. deep and crusted solid enough to carry the weight of a man walking ... yet the D Tournapull plowed at speeds ranging from 6 to 11 m.p.h.

Farm lanes of 500 to 1000 ft. were cleared to two-car width in 10 minutes with 2 to 3 passes. First pass blasted a trail up to 10'5" wide ... second and third passes cleared turn-around at the house and widened path from house to highway. Even in snow 3 and 4 ft. deep, no perceptible side draft was noticed.

Griggs County charged each farmer a small fee which covered operator's wages, fuel and other related costs. County officials report that no damage was done to paved surfaces by the rubber-tired Tournapull.

In addition to plowing both town and country highways, the "D" removed hard-packed snow and ice from city street curb lines. Material was self-loaded into 7-yd. Carryall Scraper ... then hauled away over city streets and dumped in fields. Roadster thus eliminated need for front-end loaders and hand-shovel crews and trucks.

Widening path with D Tournapull. Note how big vertical divider plate eliminates plowing snow back on road.



**See your LeTourneau Distributor  
NOW for complete information**



# WORKS Year-'round!



Cutting drainage ditches near Coopers town, this one-man, self-loading Roadster moved 35 loads an hour on 350 cycles. Round-trip time averaged 1.7 min.

## *In Summer* ... speeds conservation work

Throughout the 1949 and 1950 dirtmoving seasons, this same one-man D Tournapull operated on a fast "work-and-run" schedule for Griggs County... traveling job-to-job at speeds up to 25 m.p.h. ... and, as one county official put it, "almost doubled the scope of the soil conservation program."

Most of the work involved digging shallow 3'x8' drainage ditches. On excavation of a typical trench on a farm near Aneta, North Dakota, the "D" self-loaded 250 yards of silty loam, wasted it on low spots 150 ft. away, and finished the 400-ft. trench in exactly 2 hours.

Other jobs handled by the versatile Roadster included earthfill dams, trench silos, water reservoirs, and, during the rainy season, highway maintenance assignments. The self-loading "D" completed one typical township road repair job in 10 hours by hauling 627 yards (128 loads) of dry clay over an average one-way distance of 3225 ft.

"We can now do a more complete job of soil conservation," say officials working with the D Roadster. "The production of our Tournapull is not only outstanding on the job, but the ease and speed of moving job-to-job means small assignments are now economically sound."

You, too, will find this 122 h.p. D Roadster a time and money-saver on all your snow-plowing and dirtmoving jobs. Get all the facts from your LeTourneau Distributor ... he'll be glad to show you how this D Tournapull will put your tax dollars to their most effective use over a full 12 months' schedule. Write for complete facts, or call today.

Fingertip electric controls for steering, apron, bowl and tailgate mean faster loading and spreading with the "D."



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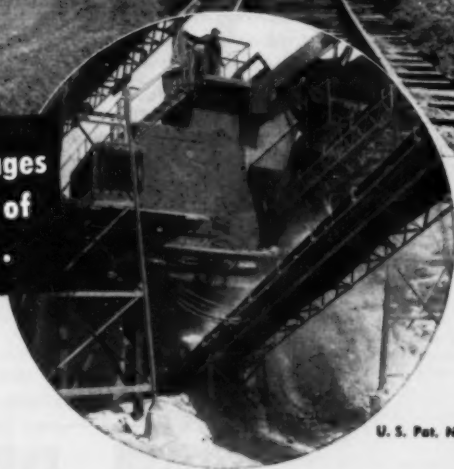
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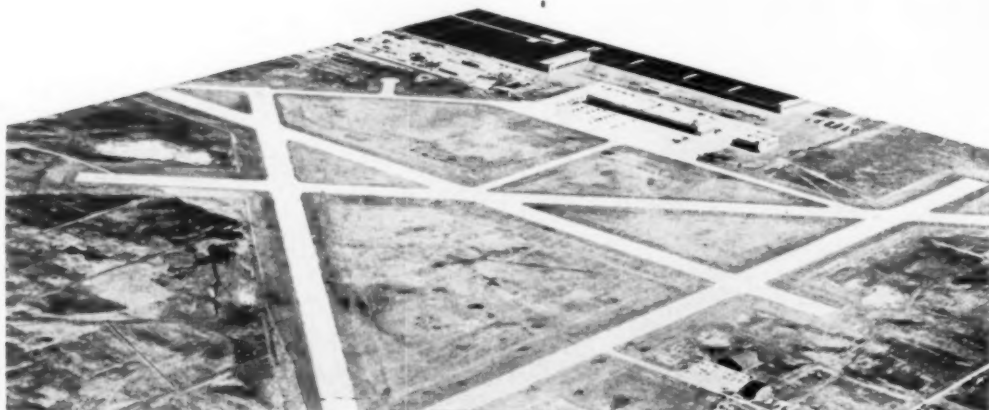
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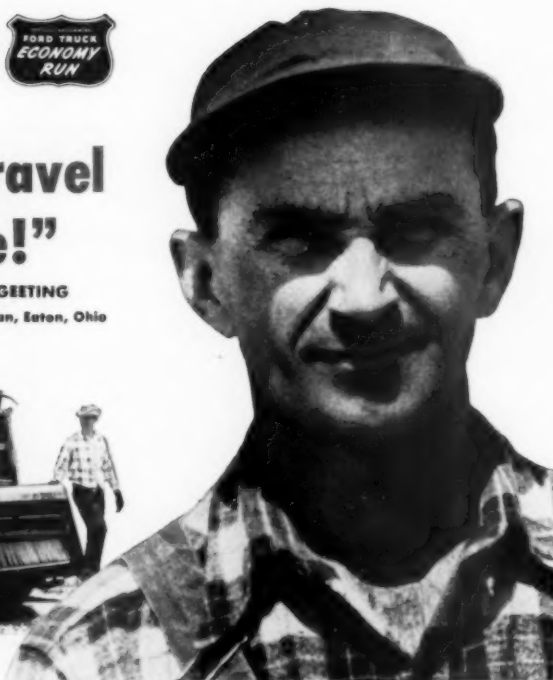
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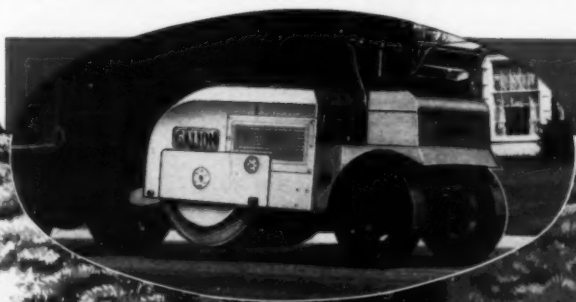
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## **MOTOR GRADERS • ROLLERS**

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.

Cable address: GALIONIRON, Galion, Ohio

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# Here's what WE mean by ***EASY TO SERVICE***



► Allis-Chalmers' new tractor line is blazing the way to simpler servicing with time and money savings never before possible.

► Adjustments are easier... lubrication simplified and lube periods greatly extended. Mechanics say these are the easiest tractors they have ever worked on!

► This all adds up to less down time, more producing time... longer tractor life at less upkeep cost.

► Following are just a few reasons why this NEWEST, FINEST TRACTOR LINE ON EARTH is *Easy To Service*... besides being built to "take it."

easy to operate and entirely new in performance. Get the full story from your Allis-Chalmers dealer.

**TIME-SAVING LUBRICATION DESIGN** — Only a few lube points, easy to get at — **NONE UNDER TRACTORS**. You operate **75 HOURS** without any greasing — then only one fitting to hit and an oil change to make. (Only exception, torque converter bearings on HD-20). You lubricate the Positive-Seal truck wheels, support rollers and idlers only once every **1,000 HOURS!**


**ACCESSIBLE ADJUSTMENTS — QUICKLY MADE** — brakes, master clutch, steering clutches. No floor plates to remove for any adjustments. Tracks easier to adjust — simple screw adjustment with automatic lock.

**EASY TO REPAIR** — Engine, master clutch, transmission, steering clutches and final drives can be easily removed and repaired or replaced, without disturbing adjacent assemblies.


## ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.


### The Newest, Finest Tractor Line on Earth!




40.26 drawbar hp.  
11,250 lb.



70 drawbar hp.  
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102 drawbar hp.  
27,050 lb.



Hydraulic Torque Converter Drive  
175 net engine hp.  
41,000 lb.

- DESIGNED FOR YOUR JOB
- BUILT TO "TAKE IT"
- EASY TO OPERATE
- EASY TO SERVICE

# Performance Records Prove...

... that trucks equipped with Eaton 2-Speed Axles make faster trips, travel more miles, at lower cost per mile. They reduce strain and wear on engine and power transmitting parts, permit the engine to run at peak efficiency under all operating conditions. Records also prove that Eaton's exclusive features, including forced flow lubrication, and planetary gearing, add thousands of miles to axle life, and assure top performance for

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## EATON *2-Speed Truck* AXLES



*Axle Division*  
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When you buy Firestones, you pay no more than you do for other tires. But you **GET** more — more rubber in the treads . . . You get double-thick, cut resistant sidewalls. You get four extra plies that protect the Gum-Dipped cord bodies, which can be retreaded again and again. And you get more service from your Firestone Dealer or Store.

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**National  
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Make it last longer. Use  
genuine P&H repair parts.

**... IT HIGHLIGHTS A**

*Better Way*

**TO KEEP AMERICA STRONG**

*Machines* are America's strength. How to preserve it in a national emergency? One way is to keep replacing. A better way is — *proper maintenance*.

The Harnischfeger Corporation and its dealers across the nation are preaching one doctrine: *maintenance*. Pointing out it takes far less steel, far fewer man-hours than building new. It curbs the breakdowns which sap our strength. It makes machines work longer, for less—and the savings add to our power.

Practice what they preach? P&H dealers are busy renewing old machines, speeding up service calls, protecting users against costly layups. The company has tripled the stocks of genuine P&H repair parts. It is devoting an entire plant to these alone—and a network of branch offices and warehouses to speed them where they're needed.

Now, through National Service Week, Harnischfeger Corporation and its dealers seek to expand service from a company policy to a national goal. For if production makes America strong, only service can keep it strong—*there is no better way*.

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QUALITY  
FOUNDED IN 1894  
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An outstanding example of what can be done with concrete is this reproduction of the Athenian Parthenon at Nashville, Tenn., used as a modern library building. Photo courtesy of Portland Cement Association.



## AN EXAMPLE IN PROGRESS



**PERFECTION** Bodies and Hoists were born with the start of a new construction era 33 years ago. They have grown steadily in ruggedness of design and construction - to meet the ever-increasing demands of modern construction requirements.

And because **PERFECTION** has maintained its engineering leadership in the truck body field, it has consistently grown in favor with Dealers and users the world over.

Write for literature.



## PERFECTION in 1951

Photo shows a modern No. 354 Heavy-Duty Dump Body, 16 feet long, 15 cu. yds. capacity; equipped with a No. 1034 Iso-Draulic Roll-A-Lift; installed on semi-trailer.

**PERFECTION**  
STAKE and DUMP BODIES  
HYDRAULIC HOISTS



**FOR ANY TRUCK**  
STANDARD or SPECIAL UNITS  
IN ALL SIZES - FOR ANY USE

Engineered, Manufactured, and Guaranteed by  
**THE PERFECTION STEEL BODY COMPANY** . . . . . Galion, Ohio, U. S. A.

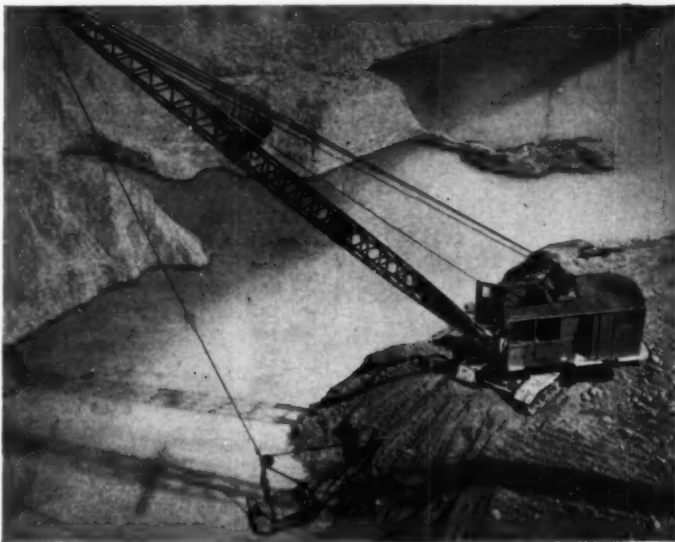
# WIRE ROPE

**You'll save time and cut costs  
with ROEBLING rope**

FAST OPERATION AND DOLLAR SAVINGS are more important than ever in excavating and construction. One sure way to save time and expense is to specify Roebbling Preformed "Blue Center" Steel Wire Rope. Here's a tough rope that stands up under shocks, strains and high speeds. Its preforming always assures maximum handling ease, better spool-

ing and much smoother performance on the job.

Roebbling makes a full line of wire rope. Have your Roebbling Field Man recommend the *right* ropes for your equipment. And for longest life, get his advice on the correct use and maintenance of wire rope. It is based on experience with thousands of installations. John A. Roebbling's Sons Company, Trenton 2, New Jersey.



**ROEBLING ALL-PURPOSE SLINGS** with the Tapered Sleeve Splice come to you ready for the job. They cost less than tucked splices . . . have the full strength of the rope. Send for the full story.

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# "KOEHRING WORK CAPACITY"

Up to 79½ TONS  
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# Only WALTER SNOW FIGHTERS

## AUTOMATIC SAND SPREADER

10-ton capacity spreader is completely automatic, controlled by one operator in cab. Replaces slow, expensive, dangerous hand shoveling. Spreads at full truck speeds, to any controlled width and distance. **IMPORTANT:** Great traction of Walter drive system eliminates need to throw sand ahead of wheels, avoiding possibility of fouling brakes and working parts.

*Most useful Unit ever built!*

## WALTER "4-IN-1" COMBINATION

Does four jobs . . . plows snow at high speed—levels and widens snow banks—scrapes packed snow—spreads sand and chemicals for ice control. Mounted on 240 h.p. Walter Snow Fighter, which provides great power and traction for most effective use of equipment. May be equipped as shown—but choice of equipment is optional. Merely change equipment to meet changing conditions.



### CENTER SCRAPER BLADE

Completely spring-cushioned, hydraulically controlled 12 foot blade scrapes hard-packed snow and ice clean down to road, without damage to blade, truck or surface.

### RIGHT SPEED WING

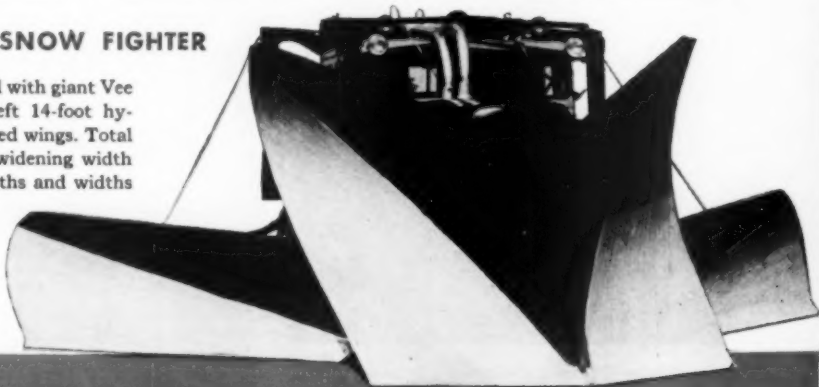
Hydraulically controlled side wing disperses windrows at high speed, provides greater width of clearance—up to 14ft. total.

### ONE-WAY FRONT PLOW

Correctly designed to remove a greater volume of snow at high speeds, throwing the snow far off the road.

## WALTER "SUPER" SNOW FIGHTER

250 H.P. model, equipped with giant Vee Plow and Right and Left 14-foot hydraulically controlled speed wings. Total clearing width, 28 feet, widening width 14 feet. Clears great depths and widths of snow at high speeds. Ideal for super highways and airports. Equipped with dump body.



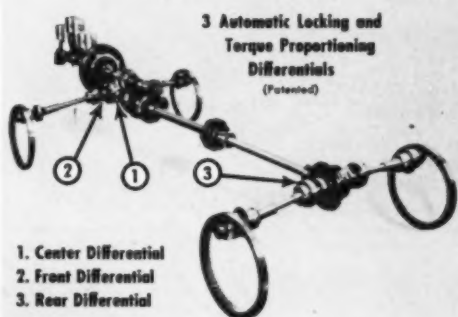
# PROVIDE 100% TRACTION for effective Snow and Ice Control!

HERE'S  
WHY!

## Exclusive WALTER FOUR-POINT POSITIVE DRIVE

### Drives to FOUR WHEELS instead of two ordinary axles

**A**LL conventional "four-wheel" drives have center differentials to control driving action between front and rear. **ONLY** Walter Snow Fighters have additional differentials at front and rear, to assure positive drive to each individual wheel, left and right. These differentials automatically proportion torque to the wheels having greatest traction, instead of spinning away power on slippery or soft surfaces, as with conventional drives.



### OTHER WALTER ADVANTAGES

**HIGH SPEED CLEARANCE.** Great power and traction maintain speeds of 20 to 30 m.p.h. through snows up to several feet deep. Snow is thrown far to the side, leaving less to be re-handled.

**GREATER VOLUME.** Big, high-capacity plows and wings, plus high speed, remove greater volume of snow on each run, clear more miles per hour.

**POSITIVE CONTROL OF DIRECTION.** Full traction on both front wheels enables driver to nose in and hold direction in widening and leveling snow banks. No side-slipping, wheel-spinning or stalling.

**RUGGED CONSTRUCTION.** Walter Snow Fighters are scientifically engineered for the job. All parts, controls and equipment are designed to contribute easy, safe handling and withstand the punishing strains of snow removal.



Walter Snow Fighter-Crane Combination



Walter Snow Fighter-Wrecker Combination

### MANY MODELS AVAILABLE

• Sizes and equipment to meet any conditions

• Wide choice of plows, wings and bodies

• Many special combinations for all-year service, such as auto-educators, cranes, wreckers, sprinklers, etc.

SEE YOUR WALTER DISTRIBUTOR  
—or write us for literature

**WALTER**  
4-POINT POSITIVE DRIVE  
**SNOW FIGHTERS**

WALTER MOTOR TRUCK CO., 1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.

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**R**

# A-W POWER GRADER

# BEST

## For What Ails Your Roads



Blading in reverse is easy, thanks to All-Wheel Steer.



All-Wheel Drive provides ample power for heavy ditch cuts.



Riding the bank to reach extra high with the 13-foot blade.



The Loader Attachment solves the ditch and shoulder cleaning problem.



The Roller Attachment has many construction and reconstruction uses.



"Controlled Traction," an exclusive feature, moves more material, farther and faster.

**BEST,** because All-Wheel Drive makes every pound of weight a powered pound, harnessed to a driving wheel. For maximum traction—primary element in Power Grader efficiency—*there is no substitute for All-Wheel Drive.*

**BEST,** because All-Wheel Steer directs and controls this tremendous traction to maximum advantage, provides superb earth-moving ability, and mastery of all types of work.

**BEST,** because of the additional values offered by specialized attachments—many exclusively Austin-Western—which greatly increase the usefulness and profit-making ability of the grader.

**AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.**

Subsidiary of Baldwin-Lima-Hamilton Corporation

**Austin Western**



...88-H...99-H...MASTER 99...



SUMMER



WINTER

**More Work Per Day**



WET



DRY

**More Work Days Per Year**



SOFT



HARD

**Thanks to the Unequaled POWER, TRACTION, and  
MANEUVERABILITY of Exclusive ALL-WHEEL DRIVE and STEER**

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.

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**Austin**



**Western**

17 Years Young  
and  
**3,100,000**  
Cubic Yards  
to show for it!

126-S Worthington-Ransome Big Mixer at Arundel-Brooks Concrete Corporation's Wolf Street plant, Baltimore, shows hardly any sign of wear after having poured 3,100,000 cu yd in its 17 years.



Worthington-Ransome 126-S discharging full 5 cu yd batch in approximately 30 seconds.



One of Arundel-Brooks' 6½ cu yd agitators pouring a retaining wall at General Sam Smith Park, being built to relieve traffic congestion at Light and Pratt Streets, Baltimore.



In 1950—its 17th year—this veteran concrete mixer poured more than 250,000 cu yds on a single set of liners!

This extraordinary performance of a 126-S Worthington-Ransome Blue Brute concrete mixer is attested to by Arundel-Brooks' records. The machine, given proper maintenance over its lifetime, shows virtually no wear after uncounted hours of profitable service.

Arundel-Brooks operates two other Worthington-Ransome Big Mixers—

an 84-S at the Sparrow's Point plant, a 56-S at Brooklyn, Md.

And eight of the company's growing fleet of truck-mounted agitators are Worthington-Ransome Blue Brute Hi-Ups, considered "highly satisfactory in every respect."

These eight are used for most long-distance hauls because their light weight\* permits carrying a maximum payload with strict adherence to highway load limits.

#### FIND OUT WHY THERE'S MORE WORTH IN WORTHINGTON

See your nearby Worthington-Ransome distributor. Worthington Pump and Ma-

chinery Corporation, Construction Equipment Sales Division, Dunellen, N. J.

\*7,250 lb for the standard 4½ cu yd truck mixer, as little as 6,700 lb for 6½ cu yd agitator models.

# WORTHINGTON



## BUY BLUE BRUTES

You'll find you, too, can get the real performance plus from Worthington and Worthington-Ransome Blue Brutes—a broad line of construction equipment noted for the rugged quality your type of work demands.

R-1-1



**IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB**



This KYSOR equipped CUCM proved for its performance in building the Big  
 Douglas Mining Company at Chisholm, Minnesota. The engine kept its  
 full 190 h.p. diesel engine running constantly at 18  
 around 24 too hours of work grade in  
 the workmen from Chicago.



PERFECT ENGINE OPERATING TEMPERATURE  
 MEANS LONGER ENGINE LIFE FOR THESE BIG "EUCS"  
***THAT'S OUR JOB!***

Longer engine life . . . longer, productive working  
 periods between major overhauls . . . fuel savings . . .  
 these are the reasons why KYSOR Automatic Shutters  
 are found on so many big "Eucs" the country over!

KYSORS are optional equipment and factory installed  
 by Euclid. Wherever the "big b-bies" move earth or  
 ore, KYSOR Automatic Shutters save in maintenance  
 and fuel. Write for complete information.

KYSOR HEATER CO.

**KYSOR**  
*Automatic* SHUTTERS

CADILLAC, MICH

# Big Red



ANOTHER BIG BITE is dumped by the shovel and Big Red goes into action, grading the dirt down the hillside to carve out a workbench for the shovel. Teamwork is essential when shovel and tractor work together. And you always want Big Red on your team.

## INTERNATIONAL

### POWER THAT PAYS



# Takes a Big Bite!

## How International's Big Red Champ...the TD-24... Tackles 40 Feet of Solid Earth and Rock

Bring on your big tough jobs! Mass up the earth and rock. Then pass the word for "Big Red"—International's Champion of crawlers.

In the heart of the West Virginia mountains, Joe Troitino is stripping more than forty feet of earth and rock overburden to bare a rich four-foot seam of coal.

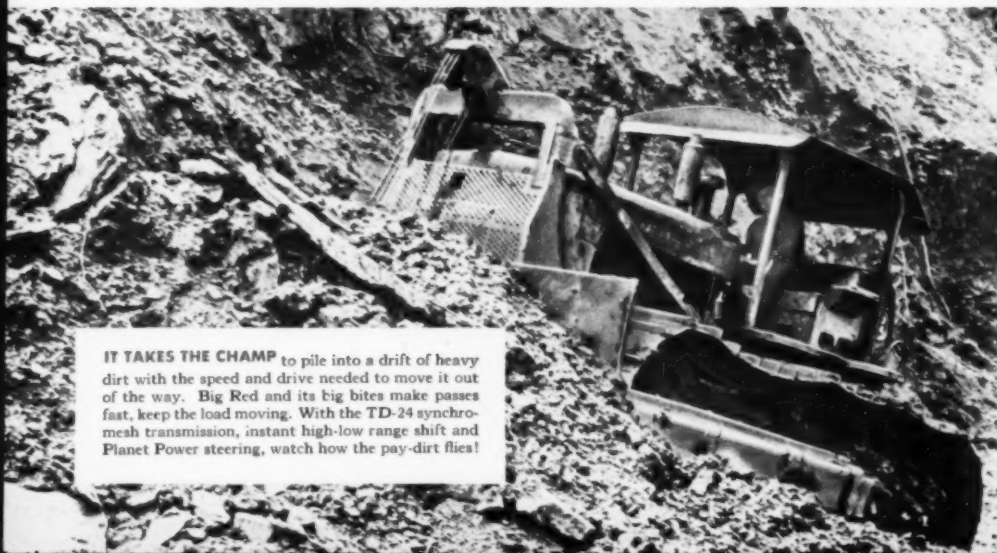
With the Big Red Champ on the job, Troitino strips about 450 tons of coal a day, and it's only one of his three coal stripping jobs!

"My company now owns six International TD-24s," says Troitino. "We think it is the best tractor on the market—and we have used all sorts of them under all kinds of conditions!

"Of course, I like the International TD-24 because it is easy to run, but, above everything else, we like it because it is more economical to operate than any other tractor we have ever used and because there is no rock or earthmoving job too tough for it."

The word is out. On the more rugged jobs, contractors who know crawlers are telling each other about the power and smooth action of the Big Red TD-24. Get the real low-down from your International Industrial Distributor. Ask him to show you Big Red in action—you'll be a TD-24 man from then on in!

International Harvester Company, Chicago 1, Illinois



**IT TAKES THE CHAMP** to pile into a drift of heavy dirt with the speed and drive needed to move it out of the way. Big Red and its big bites make passes fast, keep the load moving. With the TD-24 synchromesh transmission, instant high-low range shift and Planet Power steering, watch how the pay-dirt flies!



# KEEP AIR COMPRESSORS ON THE JOB—



regardless of operating conditions . . . with **TEXACO**  
air compressor oil

What's the best air compressor oil to keep your compressors working and your maintenance costs low? That depends on your operating conditions. But it *must* be an oil especially designed to meet those conditions. Texaco has it. For example—

★★ To assure clean operation and reduce wear under *normal conditions*, use a Texaco *straight mineral* air compressor oil.

★★ To *overcome rust* conditions in compressors, inter- and after-coolers, lines and receivers, use a Texaco *rust-inhibited* air compressor oil.

★★ To *avoid carbon and gum* formations, use a Texaco heavy-duty air compressor oil, with special detergent and oxidation-resistant properties.

★★ To *eliminate excessive wear* caused when moisture condensation in cylinders washes away lubricant, use a

Texaco *compounded* air compressor oil.

A Texaco Lubrication Engineer will gladly help you select the one proper Texaco air compressor oil to assure you greater efficiency and lower costs under your particular operating conditions. And don't forget to ask him about the Texaco Simplified Lubrication Plan for *all* your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 E. 42 St., New York 17, N. Y.

**DRILLS** of all types run better with *Texaco Rock Drill Lubricant EP*. One user states: "We are amazed at the performance of this oil in comparison with what we had been using. We have cut oil consumption 50% and have shown a remarkable reduction in maintenance on all our drills."



## TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT



# Brewster's Big Stone Trucks

**How nearly 1,000,000 tons of aggregates are being hauled a maximum of 64 miles for paving Sections 3 and 4 of New Jersey Turnpike**

**A**MONG the millions of truck-miles of hauling generated by the New Jersey Turnpike's construction, probably the largest single trucking operation during 1951 is that of Geo. M. Brewster & Son for paving Sections 3 and 4 (contracts 61 and 62).

This operation is remarkable for its size, and more so for its management. An estimated 900,000 to 1,000,000 tons of crushed trap rock for penetration base and hot mixed asphaltic concrete, including choke stone and chip stone, is being hauled this summer from the North Jersey Quarry Company's plant at Bound Brook, N. J.

Part of the stone is being stockpiled at six or seven convenient access points along the 46 miles of turnpike

line. In some cases the trucks are delivering directly to the spreaders, or the material tail-gated into place with Temple gates. However, Brewster expects to stockpile 90% of the penetration stone and 100% of the hot mix stone. Stockpiling and rehandling are considered more economical than attempting to synchronize hauling with paving operations, since the hauling must be tightly scheduled and dispatcher-controlled to achieve lowest unit costs. Maximum use can thus be made of good hauling weather and periods of full crusher operation. Rehandling for base construction is being done with clamshells, draglines, shovels or loaders, into smaller trucks which are more easily maneuvered at

the paving operation. Stone will be dozed into apron feeders at the asphalt plant.

The aggregates required for 375,000 tons of hot mix are stockpiled at the 500 ton per hour plant (four Madsen units) centrally located for the 46-mile job at Cranbury Station, N. J. This plant, owned by Brewster, is being operated by Tioga Construction Company of Lancaster, Pa., under a subcontract for production, hauling and placement of hot mix.

## Company Owned Trucks

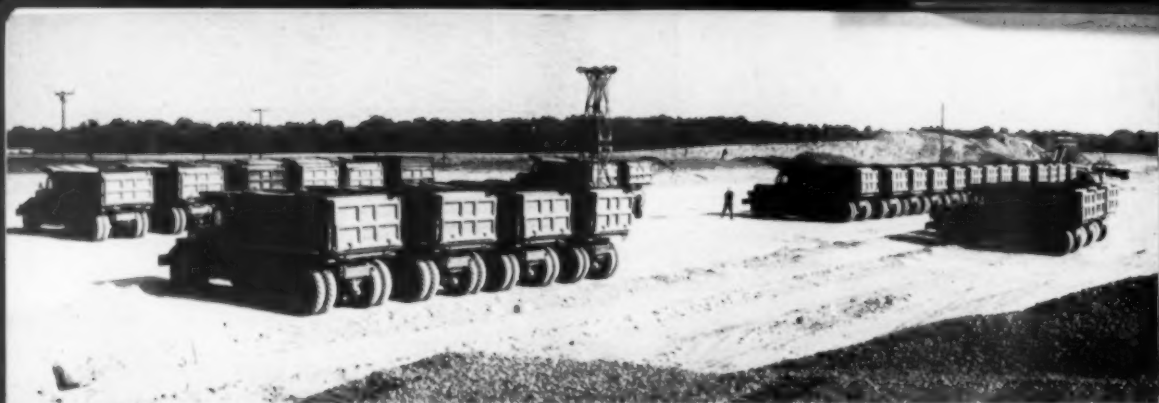
The Brewster organization is doing the bulk of the stone hauling with company-owned trucks. Of about 63 trucks, 60 are Macks with Heil dump bodies, and 3 are Whites. Additional large-capacity dump trucks and semi-trailers are working on a tonnage or rental basis.

The maximum haul is 64 miles to the southern end of the job; the minimum, 20 miles to the north end of Section 4



★ Lined up to weigh outgoing loads at the quarry. Note Temple tailgate on nearest truck used for spilling chip stone; second unit a rented "semi". Body of truck at scale house has 2 ft. high steel freeboard welded all around





★ Some of Brewster's trucks, lined up at 5 p.m. for servicing. Floodlight tower for use by night greasing crew



★ Checking in the empty, at quarry entrance. Clean looking truck, and well painted—and they're kept that way!



★ Field shop exclusively for trucks, located at the Brewster field headquarters near the asphalt plant

at the Raritan River. Haul to the plant is 27 miles. Of the estimated 30,000,000 ton-miles of crushed stone hauling, probably 25,000,000 will be over the state and local highways in the midst of traffic.

The hauling job is under an operating management of its own, with an office at Bound Brook where the book-keeping is done. A foreman floats the job in a radio-equipped car, keeping a tight rein on such matters as individual driver performance, condition of trucks, delivery schedules, tonnage demand at the job, condition of stock-piles, and supply at the quarry.

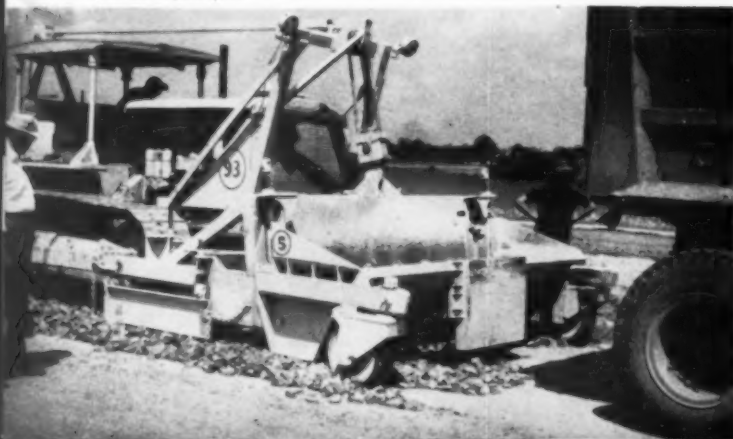
Trucks are controlled from a dispatcher's office at the quarry, where the driver weighs his load and gets his trip orders. On the empty return leg he checks in at another station house prior to reloading. Traffic safety and control have been treated as details of prime importance, especially since every ton must pass through one or more small communities. The drivers are carefully briefed on traffic regulations and company safety rules. A supervisor is constantly watching the operation to insure safety.

Load heights are systematically watched, to see that no heaped loads go out. This is to avoid spillage. Free-boards have been welded on many truck bodies to permit full loads without spillage on the highways.

Delivery had been stepped up by mid-June to 350 loads per 10 or 12 hour day, with expectations of going to two shifts and reaching 500 loads or around 9,000 tons daily in July with hot-mix production in full swing.

None of the company hauling trucks used here has radio equipment. While

★ Stone spreading for penetration base on this section of the Brewster work made use of a shop-built, large-capacity stone spreader. It is mounted on hard rubber tired wheels and fastened to a bulldozer apron, the dozer lift mechanism plus adjustable travel height enabling the foreman to set for any desired depth of spread. A faster way to spread coarse stone, it is claimed



Brewster is a consistent user of short-wave radio telephone in his highway job management, he hasn't found it advisable to equip these trucks with radio, but depends on the dispatcher and a cruising supervisor for control and trouble shooting. Supervisors' cars and repair trucks are radio equipped.

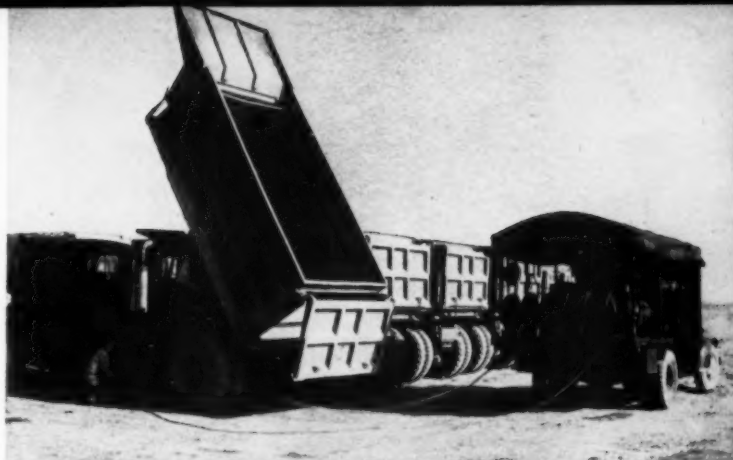
Supporting this hauling are the full service facilities which Brewster has assigned to the various hauling work connected with Turnpike contracts in the area. The field shop at Cranbury Station has a wrecker on call. Two heavy-duty tire service trucks (pictured), two 6-reel grease and lube trucks, and a well equipped repair shop, also support the truck fleet, which even has the services of a magnet truck to "de-nail" the haul route.

### Serviced Nightly

At the time of this writer's visit (mid-June) most of the trucks were being worked until 5 p.m., then parked in rows for nightly servicing. Then the famed Brewster "give 'em the works" servicing policy was put into action, a 4-man truck servicing crew taking over. This crew follows a check sheet for each truck, giving it a complete visual inspection, and whatever servicing it has due. Oil change is mandatory every 1,000 miles; other servicing operations are on an hourly or mileage basis, following factory recommendations. From 8 to 15 or more oil changes are made each night, and as many grease jobs, by this crew which works from 5 p.m. to 4:30 a.m.

Brewster's grease trucks, by the way, are "super deluxe" units. The one seen here is a 2½-ton 10-tired Chevrolet truck fitted with the following:

1. Eight hose lines (Lincoln or Alemite) for: gear lube, chassis lube, track lube, motor oil (2 lines), hoist oil, air line, and an eighth line variable.
2. Other supplies including water, Varsal gasoline, fuel oil.
3. Equipment—an Ingersoll-Rand



★ Night servicing crew in action, greasing and tire checking being started before sundown



★ Direct application of cover stone to asphalt penetration base. Most such application will be done from stockpile, using lighted trucks with or without spreaders

compressor, Kohler light plant with two floods (front and back), fire extinguishers front and back.

4. Compact metal cabinets or compartments built into each side of the truck under the bed are used to house

pumps for fuel oil and gasoline, pumps being driven from a take-off from the truck transmission.

Oil and fuel filters are stored in a dust proof compartment in the rear. The crew reports for each truck the

★ One of the Brewster tire service trucks has a generator and magnet for picking up destructive nails and spikes along the haul routes. Sample scrap collection from one round trip is pictured





★ Some of Brewster's stone is being stockpiled, with special care taken to avoid segregation



★ Brewster lube trucks have dual rear tires, two spot lights, built in cabinets and other features in addition to 7 grease or air lines

time and nature of all servicing, under the following headings (this record form suitable for all kinds of highway equipment):

1. Gas (gals.)
2. Fuel Oil (gals.)
3. Water (qts.)
4. Diesel crankcase oil (qts.)
5. Gasoline, crankcase oil (qts.)
6. Fuel injection pump, diesel (qts. oil)
7. Air cleaner (qts.)
8. Hydraulic hoist oil (qts.)
9. Transmission (qts.)
10. Differential (qts.)
11. Final drive (qts.)
12. Power unit (qts.)
13. Chain cables (qts.)
14. Crawler frame (check)
15. Gear lube (check)
16. Oil filter (no. put in)
17. Fuel filter (no. put in)
18. Battery (check)
19. Tires (check)
20. Misc. (describe)

The Brewster trucks each carry one of the new "Constructor Plates," costing \$1,050, issued by the Highway

### 38

★ Tire service trucks (Chevrolets) are each equipped with Chicago Pneumatic compressor, horizontal hoist rail with Yale chain hoist, Keystone flasher lights, Motorola 2-way radio, tools and accessories. In one scene note a general repair truck, also radio-equipped

Patrol for special hauling by large trucks, under a new law which took effect last April.

The stone is being produced in a new plant built in the Bound Brook quarry of North Jersey Quarry Co. Over a million dollars' worth of crushing and screening equipment was installed to enable Brewster to meet stone commitments for the Turnpike despite the booming demand on the local aggregate industry.

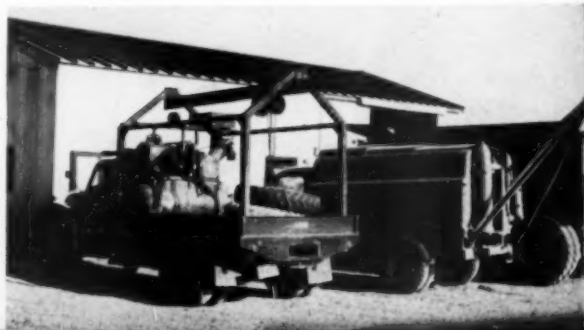
A. L. Lizee is project manager for the hauling operations of Geo. M. Brewster & Son herein briefly described, with F. E. Montgomery superintendent.

## Parking Meter Revenues

Bulletin No. 33, Highway Research Board. The purpose of the study, reported in this BULLETIN, is to examine the present significance of the parking meter in terms of the regulation it facilitates and the annual revenue it produces; to ascertain the legislative bases for installation and use of parking meters; to review the judicial decisions involving such meters; and to explore certain economic aspects of the use of parking meters.

Many of the decisions concerning the validity of parking meter ordinances have held that a police power regulation is valid only if the revenue derived is not disproportionate to the cost of the regulation. Some courts have held that a parking meter ordinance may become a revenue measure, instead of merely a regulatory one, and therefor invalid, if the receipts "continuously and by a substantial amount exceed the costs of installation, maintenance and regulation."

The necessary costs of regulating curb parking by means of meters amounts to only 15 to 20 percent of the gross revenues. The balance of the funds so obtained may sooner or later, invalidate this type of regulation, unless it is applied to further alleviate parking difficulties in pursuance of the objective for which the fees are levied in the first instance.



## Hey Washington! In the National Interest who Deserves Steel More Than the Construction Machinery Industry?

*Weigh These Circumstances. They Cannot Be Denied*

Defense agency planners are having their headaches deciding where to parcel out the nation's steel supply for the greatest national good. Whatever their reasons, they have failed to give one industry the break it needs, if defense preparations are to move ahead and the country's essential production and services are to be maintained.

This industry is the \$1.5 billion Construction Machinery and Accessories industry—one of the "Big Four." Together this quartet of front-line industries—iron and steel making, farm equipment, machine tool, and construction machinery—form the very foundation of this nation's industrial might. Why anyone in Washington should fail to put all four at the top of the allocation list is beyond understanding. This is especially mystifying in the case of the construction equipment makers, since the great job they did during World War II years is still fresh in mind.

During those years the bulldozer became the symbol of the fact that we were fighting a construction war. Tractors and motor graders and scrapers, shovels and draglines and cranes, earth wagons and construction trucks—these units by the scores of thousands, with countless crushers, mixers, rollers, stabilizers, compressors, drills, conveyors, just to name a few among hundreds of kinds of units—these machines accomplished "miracles" all too little publicized at the time or appreciated today by some of our leaders.

### **Accomplishment Record**

These machines and the countless accessories and component parts, from big husky tires to little lock-nuts, built the expanded plant that produced the machine tools that gave us billions in war materiel.

These machines built the access roads while keeping up the vast highway network which helped the nation roll.

They created the ground facilities for air expansion, grading and paving over 1,500 military runways in the continental United States alone.

And these products of the construction machinery industry dug and leveled and constructed airstrips and fighting bases all over the world to help us reach VJ day.

Yes, truly it was a construction man's war, as sure as it was a factoryman's or infantryman's or navyman's or airman's or anyone's war. And the next time we ever get into global combat we will be asked to perform tasks all the more "miraculous," in memory of the famous war-born saying, "The difficult we do immediately. The impossible takes a little longer."

The other day we watched a million dollars' worth of machinery grading the site for a jet engine plant. "They gave us four months to get this job done," commented the contractor. "We could do it in a month,

but may have to take two," he further explained, saying that "equipment of this kind is again getting mighty scarce."

### **What is "Construction"?**

The word "construction" may need clearer definition to some of our Washington leaders. Construction means more than homes and housing. More than buildings along main street, or schools, warehouses, factories, power plants and what have you. It includes roadbuilding and repair, presently in a losing race with traffic wear, to the nation's serious detriment. It means earthmoving, hauling and handling so vital to mining, logging and oil field operations.

"Construction" also means a basic segment of our national prosperity. Generator of full dinner buckets in its own right. Any time this country's construction volume ebbs, we have one of the economist's clearest storm warnings of depression at hand.

In some parts of the world, construction is still done by primitive basket methods. But this is the United States, where a multi-million-yard leveling job for a defense plant is begun today, done tomorrow, so that next day assembly lines can move.

Right now we as citizens are being asked to mortgage our futures and shell out a burdensome percentage of all we earn, to re-tool for military strength. Construction machinery is again in short supply and many of the machines will wear out and need replacement by the time we come to some new, greater emergency.

### **Only One Conclusion**

*The construction machinery industry should have a top rating and be given every possible aid in securing the steel it needs. This matter is urgent—immediate! Equipment makers must not only run at top capacity, but must add to their plant in many instances to do the job ahead. The 500,000 tons allocated to them for the 1951 Fourth Quarter is seriously short of its needs. Surely something can be done.*

So here is our plea to Washington, in behalf of our busy engineer, official and contractor readers and the public at large: For defense mobilization, for maintenance of transportation, utilities and other vital services, for full mine and industrial production, please allocate all possible steel—not only for immediate essential construction projects, but also for high-level equipment manufacturing and for the spare parts needed everywhere to keep existing equipment working.

The nation's pool of construction machinery needs to be raised from its present estimated \$7 billion level. Today this reservoir is falling. Who dares face the consequences if it goes dry?





### Edens Expressway to Open Soon

★ Edens Highway entering Chicago from the northwest will immediately carry 30,000 vehicles or more daily. This is how it looked in August, 1951. (Chicago Sun-Times Photo)

★ Vibratory spreaders are being required on all Edens paving operations. The reasoning of Cook County engineers in requiring this type of spreader is discussed in the accompanying article. Approved type spreader shown here; also the heavy forms specified



# Quality Concrete Paving

## METHODS STRESSED ON CHICAGO'S NEW EDENS EXPRESSWAY

**Vibrating spreader specified in program to assure dense, uniform, high durability concrete pavement. Opening of first link this Autumn spotlights refinements in expressway design and construction, and dramatizes the revolutionary role that limited-access highways must ultimately play in metropolitan area development.**

**By William J. Mortimer**

Assistant Superintendent of Highways  
Cook County, Chicago, Illinois

CHICAGO'S long suffering citizens have known for some years that one day they'll have a system of radial and belt expressways. In the early 40's a program was developed based on extensive traffic and economic studies. Today, initial progress can be reported on the 350 million dollar basic system. Farthest along is Edens Expressway, a section of which will be opened to traffic in October with the full 13½ miles of this \$24,000,000 highway expected to be ready by the end of the 1951 construction season.

Edens Expressway enters Chicago from the North, its line joining the projected Northwest Parkway near the city limits. Many years must pass before the Northwest Parkway can be completed into the downtown area, and until then of course, Edens will not come fully into its own as part of a continuous non-stop highway for downtown commuters. But present traffic flow along the route is 21,000 vehicles daily, and 30,000 daily volume is expected when the project is opened. Edens was chosen as the project to push to completion first because it was seen to offer the greatest immediate benefits of any of the projected city-entrance highways. It will parallel and partly supplant a section of Skokie Highway (U.S. 41), main arterial between Chicago and Milwaukee and to Chicago's North Shore suburbs. This highway with its typical 4-lane undivided roadway, crossings at grade and uncontrolled access has had a very bad accident record. The new parkway will dramatically demon-

strate how an expressway can save lives, cut travel time, eliminate bottle-necks and congestion, and stimulate business and residential development. In fact, economic studies have indicated that the project will repay its entire cost in ten years through direct benefits to users alone.

Edens Expressway aside from its broad aspects is notable for its advanced design and construction. While the details in general follow American Association of State Highways Officials standards for interregional highways and urban expressways, some interesting special features have been adopted.

The expressway's 13½ miles of main roadway is reached through 3 full interchanges and 4 partial interchanges, giving entry or exit approximately every two miles at principal arterial highways. Lesser cross streets are served by 24 grade

separation bridges, with 4-lane overpasses the prevailing solution.

The roadway, built on a 300 ft. minimum right of way, will consist of two pavements of three 12 ft. lanes each, separated by a grassed median strip varying from 12 to 35 ft. wide. Grades are limited to 3% at underpasses, and to 1% elsewhere. The parkway traverses nearly flat terrain. Curves are 1 deg. or less. The roadway is depressed for about 8½ miles from the city out to Illinois Road, to simplify the problem of providing the numerous overhead street bridges; then slightly elevated for the remaining distance. Excavation from the depressed sections was in part required to be placed as fill material for the northerly raised sections and for two railway crossings.

### Quality Concrete Control

Main roadway pavement consists of 10 in. uniform thickness reinforced portland cement concrete, supported on 6 to 12 in. of granular blanket, the base depth depending on subsoil and drainage conditions. This design based on an 18,000 lb. maximum axle load is considered adequate for the expected traffic which will include several thou-



★ Blaw-Knox spreader-vibrator used by Arcole Construction Company on Edens Expressway. Vibrating pan is located across rear of machine



★ Typical of the streamlined architectural effect achieved on Edens Expressway's 24 major bridges

sand trucks daily. Doweled transverse contraction joints are spaced every 100 ft., with no dummy or expansion joints. About 850,000 sq. yd. of concrete pavement is included in the project.

Colored concrete is being used for on and off ramp paving, to warn and direct drivers. Ramps are of generous width and length at their convergence with the main roadway; all acceleration and deceleration will take place off the main roadway. Curved ramps at cloverleaves are superelevated up to 21 in. for this reason.

Special attention has been given to the problem of securing highest quality in concrete paving construction. Our engineers have capitalized latest developments in finishing equipment to secure satisfactory and economical placement of low-slump mixes, a slump of 1" to 1½" being required. Illinois state highway specifications which date from 1942 call merely for the use of a mechanical finisher. The Cook County highway department, with state approval, after considerable investigation has included certain special provisions in all its expressway paving contracts. One clause required that concrete forms have a base width of not less than 10 in., with the metal in their construction ¼ in. thick or thicker. This is in recognition of the heavier equipment which forms must carry today, and the importance of good forms in securing an even pavement.

Most important provision is the requirement of a specific type of mechanical spreader equipped with a vibrating pan. This unit has in our belief gone the farthest of any equipment yet developed to assure satisfactory placement of a relatively low-water-cement-ratio concrete. Contractors have used this equipment, followed by a mechanical finisher, longitudinal power float, and long-handled hand float. The result has been exceptionally uniform, dense concrete, ac-

ceptable to the engineers and free from the difficult finishing problems normally encountered when dry concrete is used. From the contractor's viewpoint the results have been equally satisfactory, the various contractors being able to meet our requirements with a minimum of labor and other job expense, while maintaining satisfactory daily progress. Exceptional daily or seasonal footages have not been reported by any of the Edens Parkway contractors, however, principally due to the short work sections, complicated nature of the project, weather delays and material shortages. Vibrating screeds of approved design are required at ramps and on special sections where the vibratory spreaders and mechanical finishers cannot be used.

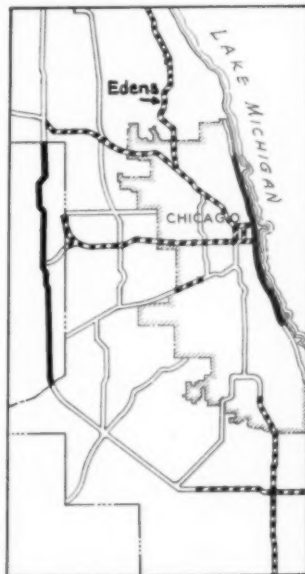
#### "Next-Day" Inspection

Another special provision requires the contractor to remove the curing cover on selected sections the morning following placement of the concrete, to permit the engineers to test for surface evenness. A smoothness tolerance of ¼ in. in 10 ft. is specified. The curing paper or burlap must be removed by not later than 10:00 a.m. Immediately after the straightdging is performed and the surface found satisfactory, the contractor then must wet the concrete surface thoroughly and replace the curing cover. This specification requires that the concrete be thus exposed not over one-half hour. Such testing must be done following each of the first three days of pouring, the expense involved being covered in a bid item. The engineer may subsequently require similar next-day inspections at any time, for which the contractor is paid at the same unit price, measured on a basis of units of 100 lineal feet of pavement poured in a single operation, regardless of the width of curing cover used.

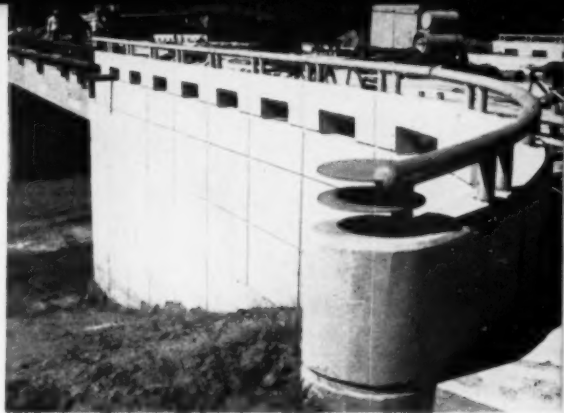
The middle 12-ft. lane of the 3-lane pavement is required to be concreted

first, a point which at first brought objections from the contractors. As noted on the cross-section sketch, each 36-ft. roadway drains to both sides, the center 12-ft. strip having a circular segment crown and the outer strips sloping transversely on tangent. Obviously placement of the center lane first is desirable to insure surface drainage during all subsequent work stages.

The engineers have also insisted upon exceptionally rigid inspection and control of aggregates, to insure against segregation in stockpiling and handling. One contractor has greatly simplified his problem, and ours, by using the latest high-accuracy, auto-



★ Principal expressway links planned for Chicago area, with Edens Expressway shown in relation. Existing expressways in solid lines; 1951-1957 program in dashed lines; proposed future project in parallel lines



★ Architectural treatment of facias, handrails and abutments followed a "no two alike" policy, with unity of overall effect. Note exposed, painted steel fascia on one structure

matically-controlled (Blaw-Knox) weighing equipment for concrete sand and gravel.

### Concrete Problems Discussed

Much interest has centered in our effort to assure highest quality of concrete and surface finish. We have closely approached the production of "Laboratory" quality concrete in the field, without the job requirements making the cost prohibitive. Theoretically perfect concrete entails virtually perfect control of aggregate gradation, proportioning, water content, and manner of placement. This involves uniform batches of very dry concrete which, with proper vibratory compaction results in a dense, high strength pavement having minimum water content.

The vibratory spreader has been considered of great importance on Edens Expressway as it spreads the concrete to the required depth and simultaneously compacts the entire mass, immediately sealing the upper surface against the drying effect of sun and wind, and bringing to the top only sufficient grout and moisture to enable the finisher to function as a

troweling tool. The finishing machine can produce comparatively little effective compaction when used on dry concrete as its ability to compact is in direct proportion to the weight of the screeds.

Therefore a stiff mix which has been placed without being compacted by vibration, may be properly densified only a few inches down, leaving the lower depths relatively porous. On the other hand, it is our experience that a spreader having a pan vibrator can thoroughly and completely compact a low-slump (1 to 1½ in.) mixture at normal travel speeds of the equipment.

Too little attention has been given to the phenomena introduced in the finishing and hardening phases by the use of air entrained concrete. We are not questioning air entrainment as a means of providing scale resistance under chloride action. Our point of concern is that air entrainment encourages free water in the mix to go down instead of up during the spreading and finishing process. The result is a sticky surface, often difficult to manipulate without tearing under the finish float.

This resistance to finish usually results in the contractor's finishers being forced to complete their work quickly as possible where vibration has not been used. A common practice is to straightedge immediately and move forward as quickly as possible, attempting to get off the pavement before the tacky or sticky stage has been reached.

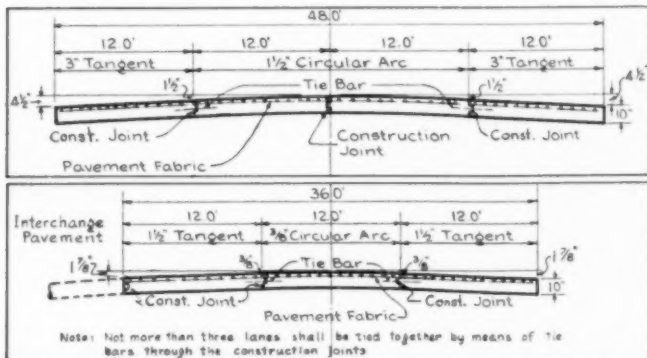
### Over-Night Creep

This early completion usually presents a satisfactory surface at the time. However, since the free water has gone down into the mass and the surface becomes tacky during the early stages of initial setting, the interior is still in a semi-fluid state, as it has not been fully compacted and excess water squeezed out. Therefore, during the latter stages of setting, this mass (under certain conditions, which will be discussed) has a tendency to push or creep, resulting in an uneven surface within 12 or 18 hours, whereas the concrete was perfectly even when it was originally finished. This slightly washboard effect, which is caused by the creeping of the semi-fluid concrete, has sometimes been a headache to this highway department. There is only one known method of eliminating this tendency of air-entrained concrete to creep and that is by thoroughly compacting it with vibration while placing.

### Hot Dry Winds

We know you can build fine concrete pavement with air entrainment. But on hot, dry, windy days we sometimes have found the aforementioned creep to take place. On the Calumet Tri-State Expressway in our County program, a section paved during 1950 under ideal weather conditions was free from unevenness.

On the other hand a project on Willow Road where only four bumps were detected while straight-edging immediately after finishing, more than 50



★ Typical cross-sections of concrete pavement for Edens Expressway main road-way



★ Among various operations by the Edens Expressway contractors, this group is of particular interest because it demonstrates multiple use of equipment. At right, an Allis-Chalmers HD-5G tractor, after aiding in excavation of some 80,000 cu. yd. of excavation, is seen pulling a subgrade finishing screed. At other times its front-end shovel was used in raised position to transport the screed or other lighter equipment items, or the shovel was used for various leveling or loading jobs. The middle scene shows an Allis-Chalmers Model D motor grader, equipped with a shovel-loader—another example of double-duty

bumps were found one month later. A possible factor was the creep which is believed to occur sometimes when pavement is finished in very hot, dry, windy weather. The use of a vibratory spreader is considered as insurance against the hazard of this occurrence.

Concrete aggregates in relation to air entrained concrete were the subject of special study by the Cook County staff. The aggregates which follow Illinois state gradation specifications consist of 2½-in. maximum crushed gravel and sand fine aggregate. Two general conclusions from this study were used to guide our thinking and job planning.

A. Care is necessary in the selection of a well-graded aggregate, because the final consistency of the concrete is affected by the aggregate size, resulting in a definite relationship to the final shrinkage factor.

B. Definite control measures must be exercised in the field operations. This applies to aggregates used in test samples as well as in batching. These controls are important in preventing

★ Drill rig taking soils samples for advance soils engineering studies along the projected route of Edens Expressway. Cook County highway department owns this unit



★ This type of gutter is used on some section of Edens. Here a Dotmar Speed-master curb-and-gutter paver is being employed by contractors R. R. Anderson Co. & Milburn Bros., Inc.

excess air entrainment at the mixer, and in mixing, placing and finishing.

Proportioning engineers have regularly made 5 to 6 tests daily on each paver operation.

Still another point worthy of touching on is the use of low slump. A dry mix with minimum surface manipulation is sought on Edens Parkway to eliminate all chances of surface grout or laitance. Much has been written in technical literature on this subject, but many pavements placed today still are not truly homogeneous, with wear resistant course aggregate in the top. The ideal concrete slab should resemble the cross section of a peanut bar, with the coarse aggregate embedded close to the surface and only sufficient grout around these particles of coarse aggregate to properly hold them in place and seal the pavement from the elements.

#### Notes on Soils Engineering for Edens

Soils investigations were conducted throughout the entire length. Sub-

grade hand auger borings were spaced at not more than 300-ft. intervals, and ranged down to 25-ft. intervals in questionable areas. The majority of subgrade borings were carried down to a depth of 6 ft. below the proposed pavement grade and many were made deeper in order to acquire information for the design of the required storm sewer system. Bridge foundation borings were made with the use of a core drill adopted for continuous dry sampling.

After laboratory testing, all soils were classified in accordance with the Bureau of Public Roads system of classification. Field and laboratory data were then correlated in the form of soil profiles.

As a result of these studies, a peat area was given special attention in an attempt to consolidate the deposit without resorting to costly removal or bridging. Our experimental, remedial measures consisted of the construction of a combination surface and subsurface drainage system together with the superimposing of embankment loads



about a year prior to the paving operations. Observations of the area under moving equipment loads indicate that the results may be gratifying.

In another small section of the Expressway, because of the softness of the subgrade, construction operations had to be facilitated by the cutting out of approximately 2 ft. of soil, spreading, drying, and replacing in 6-in. layers.

### Bridges Varied Architecturally

The 24 structures were designed by the county's bridge and architectural engineers with special attention to modern appearance consistent with economy and durability. Rather than follow a standard architectural motif, the structures were given variable treatment with a common goal, however, of streamlined simplicity. Various types of handrails were employed, and striking effects obtained in the treatment of facias, piers, abutments and wing walls. Exposed aluminum painted flat steel facias are a notable innovation used on several overpasses. Structurally the bridges consist largely of continuous steel girder spans, supported on concrete piers and abutments. The 4:1 earth slopes along the depressed roadway are increased to 2½:1 under overpass bridges. This slope is grassed except for areas beneath bridges, which are paved with asphalt penetrated stone macadam [December, 1950, Roads and Streets].

Lighting is planned throughout the parkway. In the initial stages we expect to delineate the interchanges by use of battery operated flashing lights. Flashing lights will be a permanent part of the final scheme, since we are convinced that special warning as well as illumination is needed to minimize night accidents at special points along an expressway where a considerable traffic volume may be carried throughout the night.

### Economic Need Shown

Edens Expressway, like other such facilities, will carry such a tremendous traffic that extra care is justified in building durability into the roadway. Our thinking and practice in regard to concrete are here set down in some detail because we in the Cook County highway organization have been "thinking concrete" for many years.

The economic urgency of this typical urban expressway project is such that studies were made to determine the estimated dollar value of a contemplated delay in opening. This delay, which would have postponed completion until next spring, was threatened by the fact that the soil was ponded and saturated along some of the contract sections, due to storm collectors



★ With proper vibratory compaction at time of spreading, honey-combing is eliminated, as shown here by this "perfect" slab edge

not being completed. Proper subgrade consolidation was impossible by ordinary means. The studies showed that the time saving to motorists alone would justify an extra expenditure to excavate and replace the ponded material or blend in granular material. The contractors were told to go ahead.

Completing the highway at an early date will effect the following estimated savings according to this analysis:

Time savings to motorists and truckers based on an average of 25,000 vehicles per day and using a conservative cost of \$1.00 an hour per car, would amount to \$90,000 for a 6-month period.

The saving to the public by preventing accidents which cannot occur on an Expressway is another \$75,000 for a 6-month period, bringing the total savings to \$165,000. For every month the Expressway is inoperative, it is costing the motoring public around \$30,000 in these direct items.

The expressway when opened to the public late this year will give Chicago a new picture of the safe, rapid, non-stop traffic movement possible only with limited access facilities.

Edens Highway design was under the supervision of Hugo Stark, assistant chief engineer, with construction supervision under L. J. Ryan, chief engineer of construction. Duncan M. Campbell is chief engineer of the Cook County highway department.

### "Ridging" Snow Successful in North Dakota

A method of reducing the amount of snow drifting onto highways, called "ridging," is being used by the North Dakota State Highway Department. Although "ridging" is not new in the State, it has been used more extensively of late.

"Ridging" was used in several areas where roads were blocked with snow for long periods. Although the snow was as heavy or heavier driving these periods, the Highway Department was able to keep these sections of road open this year.

### North Dakota Tries Inclined Snow Fence

The principle of this type of fence is

to deflect air currents toward the road surface and thus blow it free of snow rather than to impound the snow which is the normal function of snow-fencing.

This type of snow fence is placed at the top of the backslope. It is constructed of regular slat type snow fence placed at approximately a 45° angle with the ground surface and with the high edge about 4 feet from it.

The lower edge of the snow fence is toward the road. Two rows of posts are required for this type of installation.

T. N. Erickson, Division Engineer, North Dakota State Highway Department, advised that the installation placed at an underpass near Antelope had materially reduced the amount of snow on the road as compared to that lodging on the road in previous years. He is of the opinion that this method of placing snow fence offers possibilities in many locations where terrain prevents adequate impounding of snow with the conventional snow fence.

### Turnpike Contractor Lays 6,166 Ft. Concrete in Single Day

Construction records continue to topple as the 67-mile Western Extension of the famed Pennsylvania Turnpike System roars toward completion.

Latest to be inscribed into the books is the 6,166 feet of concrete, 12 feet wide, laid by the L. G. Defelice and Son Company, of North Haven, Conn., in a single day.

Two crews, laboring day and night, performed this record on August 1, 1951. The previous record of 5,302 feet was set by the Williams Paving Company, of Norfolk, Va., during construction of the 100-mile Philadelphia Extension in 1950.

A 10.9-mile stretch of the new Western Extension from Irwin to the Pittsburgh Interchange, near Monroeville, was opened to traffic on August 7. The Commission and its contractors are going full speed ahead to complete the remainder of the extension, from the Pittsburgh Interchange to the Ohio border, sometime in the fall.





★ Normile grade, Chinook Pass. Two dozers making good wastage on canyon side. Washington citizens and visitors today take virtual 365 day-a-year service for granted through most passes

## How Washington State Road Crews

# Keep Passes Cleared

**Over \$1,500,000 expended last winter to meet mounting costs and provide improved winter traffic service. Notes on the winter's program and methods**

**By K. G. Miller**

Associate Highway Engineer, Washington State Department of Highways, Olympia

**S**NOW fighting, sanding and related wintertime maintenance operations in the passes have become increasingly important in Washington. While the basic methods have not changed greatly in the last few years, our service to the public has improved progressively. It is timely to review our program and some of our problems and methods. The following notes, relating principally to last winter's work, give an up-to-date picture of this service.

The winter of 1950-51 was comparatively mild. The snowsheds on Snoqualmie Pass were of considerable value in keeping traffic clear at Airplane Curve on the west side of the Pass and at Lake Keechelus on the east side. These two points have been particularly troublesome in previous winters due to slides.

The major passes of the State Highway System are through the Cascade Mountain Range. They are Stevens Pass, Elev. 4061 on Primary State Highway No. 15 (U.S. Route No. 2), Snoqualmie Pass, Elev. 3004 on Primary State Highway No. 2

(U.S. Route No. 10), Satus Pass, Elev. 3149 on Primary State Highway No. 8 (U.S. Route No. 97), Chinook Pass, Elev. 4500 on Primary State Highway No. 5 (Alternate). The first three passes are maintained throughout the year. Chinook Pass is maintained ordinarily from June 1 to November 1 each year. The White Pass Branch has recently been completed and was opened for traffic in August of this year. Some studies are being made as to the feasibility and economic value of maintaining this road through the winter.

### Snoqualmie Pass Data

Snoqualmie Pass carries a pre-dominance of traffic from east to west. The expected total annual snow fall on Snoqualmie Pass is 500 in. This has ranged from 333 in. in 1946-47 to 631 inches in 1948-49. The maximum depth at any time during the past 15 years ranged from a low of 66 in. in 1940-41 to a high of 280 in. in 1948-49.

Temperatures on Snoqualmie as low as zero Fahrenheit are rare and do not last for any extended period. Normal temperatures for the winter months range between 25° F. and

33° F., and the maximum snowfall occurs in this range. The condition considered most hazardous and difficult to combat, as far as highway maintenance is concerned, is that caused by an extremely warm front with winds and driving rains moving in swiftly from the Pacific. This condition often results in the following:

1. Massive snow slides from adjacent precipitous slopes—loosened by warm winds and rain—often covering the roadway from 6 to 20 ft. depth, and from 10 to 1500 ft. length.

2. Compacted "snow bottom" formed into an extremely slick and river-like roadway. The run-off from heavy rains carries off applications of sand and salt as it rushes down grade between snow banks in the plowed area.

3. What has been a compacted snow bottom 2 to 5 in. thick swells mushily into a mass 8 to 12 in. thick on the roadway.

The snow camp at the summit is manned ordinarily from the first part of November until the latter part of April, or longer if necessary. The worst weather conditions occur during December, January and February. Throughout the entire snow season the crew of 30 to 40 men are on call 24 hours a day, 7 days a week in emergencies.

The areas causing the greatest on account of slides, which bring down snow, rocks and timber, are near the

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★ First operation in opening Chinook Pass. A D7 Caterpillar dozer "pioneering" a cut through 6 ft. of compacted snow. Operator works along the center line, to points where snow can be dozed over the slope. Two miles below summit



★ Dozer breaking up packed snow in bottom of rotary cut and feeding to rotary, which is throwing over the top



★ Final clean-up operation on Chinook Pass, with shovel sloping the cuts and rotary removing snow from roadway, just prior to opening road to traffic



★ Immediately behind the pioneering dozer, a rotary equipped with a "digger" as shown makes pass, loosening compacted snow and deepening the pioneer cut with help of a dozer

Summit on the western slope in the vicinity known locally as "Airplane Curve" and on the east side in the vicinity of the upper end of Lake Keechelus. Cost of snow removal and ice control which are necessary in order to maintain traffic of an average of 3200 vehicles per day, has increased approximately 400% during the past 15 years.

The economic loss to motorists in cars, busses and trucks is enormous when they are held up on account of slides or snow conditions. The greatest accumulated time of closure for a 30 day period was recorded from December 7, 1948, to January 7, 1949, and amounted to 145 hours. The economic loss based on 2c per minute per passenger car and 5c per minute per truck at the annual average rate of travel in 1950 would exceed \$5900 per hour, it is estimated.

In order to cut down the economic loss to the motoring public, and also reduce the maintenance costs as far as possible the Department has constructed snowsheds in the two areas of greatest danger. The previously existing timber snowshed at Lake

Keechelus has been removed and replaced with a reinforced concrete structure 500 lin. ft. long. A similar structure 1300 ft. long has been constructed in the vicinity of Airplane Curve. These structures have a minimum vertical clearance of 15 ft. The previous two-lane roadway has a paved surface 20 ft. in width. The new construction provides for four traffic lanes each 12 ft. The inside, or uphill two lanes, are covered by the snowsheds, and are maintained during the snow season. These lanes will be paved with cement concrete pavement. The outside two lanes have been temporarily surfaced with a light bituminous treatment.

The four lanes are divided at the center by the columns supporting the down-hill side of the snowsheds. During the snow season the sheds discharge slide debris into the outside two lanes where its removal does not interfere with traffic. These outer lanes provide for 4-lane traffic outside of the snow season. The transition from four lanes to two lanes occurs within 150 ft. beyond the portals of the snowsheds.

The sloughs and spillage over the ends of these sheds have occasionally blocked traffic for short periods of time but the major closures appear to have eliminated on this Pass.

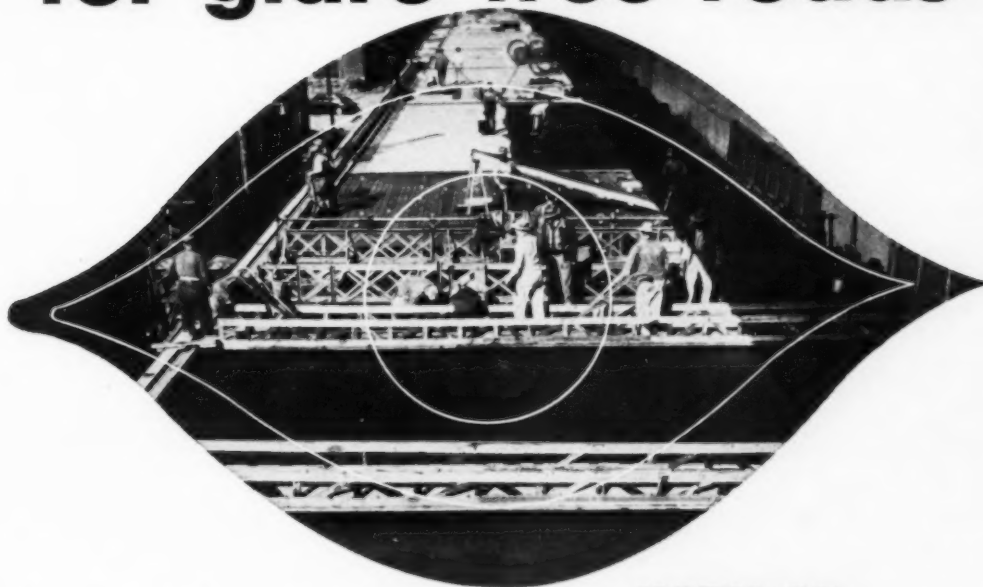
#### Prefer Smaller Trucks

The larger 5-ton dump truck push plows are gradually being replaced with smaller 2-ton and 2½-ton 4-wheel drive trucks. The advantage is that due to higher speeds more road can be covered and the snow is thrown further over the shoulder.

A larger number of heavy power graders are being used in an attempt to cut to a minimum, or eliminate whenever possible, a packed snow and ice bottom on the roadway.

Each year, larger quantities of sand are being used to keep an ever increasing volume of traffic moving safely over the pass. The use of sand from unprotected piles is very unsatisfactory in that it is difficult to load and spread, and that it does not give effective cover due to its frozen, lumpy condition. In 1947, a sand shed 91 x 36 ft., was constructed at Snoqualmie Summit. A sand shed 71 x 36

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ft. was constructed in 1950 at Easton; and we plan the construction this year of a 71 x 36 ft. shed at Price Creek. Two hot air blowers (extensions of the shop heating systems) were installed in Snoqualmie Summit sand shed. They keep the sand dry to 8 to 10 feet into the pile.

Stevens Pass is approximately 1000 feet higher than Snoqualmie. Snow fall is comparable in both passes although it is somewhat greater on Stevens. Snow camps are maintained at both Summits with crews of about equal size. The precipitous slopes on Stevens Pass offer a constant threat of slides ranging from bank puffs 25 ft. long and 10 or 12 ft. deep, to 1000 ft. long and up to 40 ft. deep. Continuous patrols are maintained 24 hours per day 7 days a week.

Both Stevens and Snoqualmie Summits are popular skiing areas and are visited by thousands of skiers each weekend during the snow season. Parking areas are provided at the summit camps, but occasionally skiers park their cars on the plowed shoulders of the roadways. These are a continual hazard during times of heavy snowfalls as they restrict the operations of snow-moving equipment. Then too these cars are subject to being swept over the banks by slides of avalanche proportions. Another impediment to snow removal is experienced when a number of vehicles become trapped between two slides. Such a condition is not unusual during the peak of the season.

Chinook Pass normally is open for traffic approximately 6 months of each year. The highway is restricted to passenger vehicles only, or light trucks of the pickup class. It is one of the more scenic highways of the State system. From Enumclaw, approximately 40 miles southeast of Seattle, the highway follows White River to the Greenwater, then swings south through the eastern boundary of the Mt. Rainier National Park to Cayuse Pass and crosses the summit at Chinook Pass at an elevation of 5440 ft. Snow depth of the summit is normally 20 to 25 ft. at mid-season.

On the west side of the summit snow operations are controlled by Highway District No. 1 from Crystal Creek Snow Camp, 37 miles east of Enumclaw and approximately 4 miles from Cayuse Pass, locally known as Park Junction and connects with an alternate route of PSH No. 5 which traverses the eastern area of Mt. Rainier Park to Ohanapeecosh.

#### Chinook Pass Methods

Usually after November 15 the summit is unsafe for traffic and the

pass is closed for the winter. From that time until April the snow crews concentrate on keeping the road open to the Cayuse Pass ski area. Over the 3 miles from Cayuse Pass to Chinook Pass the average snow depth is 12 to 20 ft.

About April 1st each year the crews undertake to open the highway to the summit. Two bulldozers and two four-wheel-drive trucks with rotary plows are employed in the initial operations. One dozer working two shifts pioneers a trail as nearly as possible in the center of the roadbed, wasting the snow over the side. Widening of the pioneer cut is accomplished by the rotaries. At times their operation is enhanced by being fed to by a bulldozer which breaks down the banked snow for the plows.

About one mile from the Summit there is a series of three switchbacks. From the lower elevation of these the dozers push a pioneer road to the upper levels. Snow cast over the banks on the upper levels rolls down over the by-passed sections and must be handled again in the final cleanup.

This work is under the direction of a Foreman, Palmer Larson, who has had some 20 years experience on this section. Normally it takes 2300 man-hours and approximately 1300 machine hours. The crew consists of 4 equipment operators, foreman and camp help. Two-way FM radio is installed in equipment and at camp.

The boundaries of State Highway Districts 1 and 5 meet at the Summit. However snow crews disregard district lines in that one crew continues snow removal operations until it meets the crew from the next district.

From the eastern end of the Pass snow removal operations extend from Morse Creek to the summit, a distance of 5.5 miles. The deciding factor each year in determining when this opera-

tion may begin is the condition of the massive snow overhangs on the cliffs above the roadway. Trips are made on snow shoes by trained personnel to ascertain when these have sloughed sufficiently to permit the use of men and equipment safely. Experience has taught us that starting too soon could easily mean the loss of crews and equipment in the canyon below.

The operation on this side is approximately a duplication of the west side, except that the tangents are longer and there are no switch-backs. The operation started this year on May 1st. On May 15 a hole was punched through at the Summit. The pass was officially opened for traffic May 19. The operation was somewhat streamlined this past season. Small truck-mounted power shovels supplemented the work of the rotary plows in bucking the icy masses. Portable cook and bunk houses were available for use of the east end crew.

Personnel on the east side consisted of 4 equipment operators, a foreman and camp crew. 564 man-hours were expended and 436 equipment hours, supplemented by some 200 equipment hours by 3 pickups and 1 dump truck. Total man hours for the Pass opening, 2864; total equipment hours for the Pass opening, 1936.

Following the opening of the pass a 24-hour-per-day, 7-days-a-week rock patrol is maintained for 6 to 8 weeks due to the fact that melting snows and resultant run-off make falling and rolling rock a constant hazard.

The White Pass branch of Highway No. 5 at elev. 4500 ft., was constructed in part by the U. S. Bureau of Roads through the Mt. Rainier National Park. The connecting link has but recently been completed and opened for traffic. It traverses the Cascades in the vicinity of Mt. Rainier through a scenic section. Unlike Chinook Pass this highway will not be restricted on truck traffic. It is some 940 ft. lower in elevation, has longer tangents and easier curves and grades. No attempt will be made to keep this Pass open during the coming winter; there are no facilities at the Summit for housing men and equipment. Some studies are being made for providing such facilities as well as parking area for skiers and possibly a Traveler's Rest Station.

Snow removal and ice control during the 1950-51 winter cost the Washington Department of Highways \$1,493,156.76 for some 6300 miles of primary and secondary highways. This work is carried out by district forces under the direction of R. P. Newland, Maintenance Engineer, State of Washington Department of Highways of which W. A. Bugge is Director.



★ Lake Keechelus Snowshed of concrete construction, Snoqualmie Pass, Washington



# Bituminous

## ROADS AND STREETS



### Cover Scene

Drag broom operation, seal coat project, US99, Siskiyou County, California; Morgan Construction Co., Contractor (See brief article in this issue)

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SEPTEMBER, 1951

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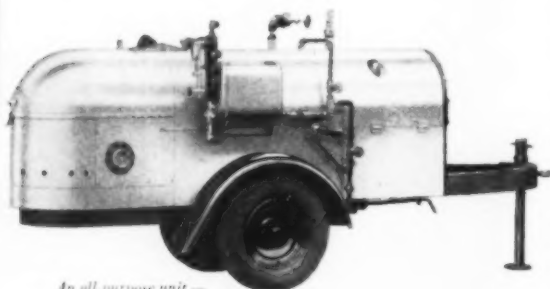


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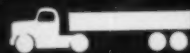
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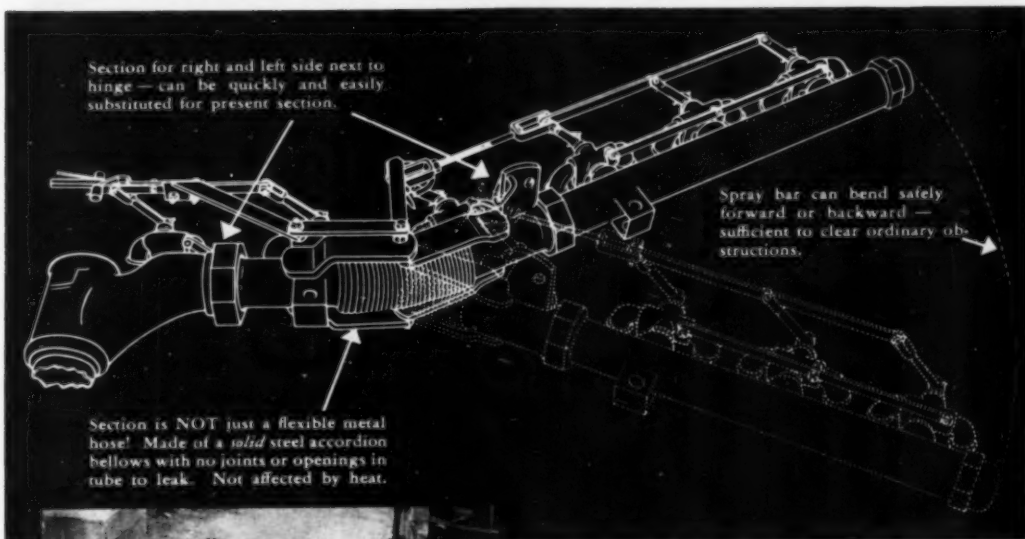
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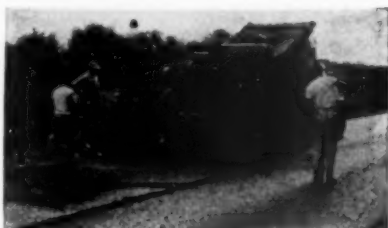
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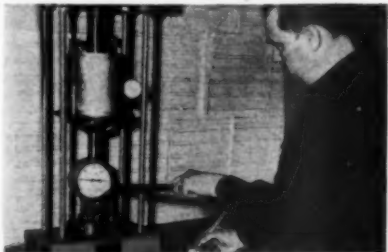
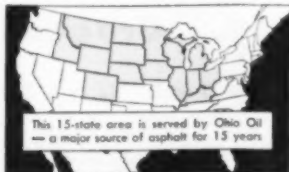
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## Editorial



## Your Seal Coating—it Pays to Do it Right

One of the largest single items of maintenance expenditure today in state, county and township road programs is that of seal coating or surface treatment. This familiar task runs into tens of millions of dollars annually throughout the country.

Because of the magnitude of this work, great savings in terms of increased highway durability and economy can be effected by achieving even a small percentage of betterment in the technique. Yet we are just beginning to understand the fundamentals involved in seal coating, and most highway maintenance personnel involved have a long way to go to reach perfection. "Rule of thumb" is the rule more often than not, and this very frequently is another way of saying "hit or miss."

### A Good Investment

Even the ordinary imperfect surface treatment is usually a good investment, justifying the expenditure. It affords protection to the surface mat, helps preserve the investment in the road. But all too many engineers and officials stop right there in their attitude. As noted by one of our engineer friends in the supply business, not enough have passed the stage of thinking where they give consideration to a seal coat's ability to assure any benefit beyond protecting the base and mat from water infiltration.

Actually, for little or no extra cost the maintenance funds required for a water-proofing coat can be made to assure a safer, better riding surface if the necessary engineering is put into the design and construction. Surface treatments, remind engineers in

the California division of highways, have not merely one but *six* possible functions: seal the road; create a non-skid texture; enliven the surface and make it last longer; reinforce and build up the roadbed progressively; provide visible demarcation for shoulder edges; and improve luminosity for safety at night.

Of course practical experience and judgment are indispensable. The engineer is constantly confronted with decisions as to types and quantities of bitumen and cover material to be best applied for a given situation. And he has a constant task of providing job control.

### More Research Needed

Our plea here is also for more engineering development, more research spirit in the business. Engineers of the more progressive asphalt companies have contributed a great deal to our basic knowledge of seal coating. So have a few of the state and county highway departments, but only a few.

Meantime, a lot of available knowledge is waiting to be picked up and put to work, with little excuse for not capitalizing on it more fully. Compared with the design and construction of mats, bases, and pavements generally, surface treatment involves relatively simple procedures and laboratory facilities. Even the smallest highway organization can run a series of screens and thereby control gradation while the other characteristics involved in a good seal coating job can be estimated from data obtained from state highway department laboratories, if not from

simple judgment until such data are obtainable.

What is your highway organization doing to insure a better job of seal coating as a means of providing better, safer, cheaper highway service?

### California Road Test Project Planned

The Western Association of State Highway Officials will soon undertake a test program on bituminous pavements in the far west, patterned after recent tests in the east (Maryland) on concrete pavements. The tests are being conducted to determine the effect of various heavy traffic (axle loadings) on the pavements.

A special section of road, 2,200 meters long, will be built for the bituminous pavement tests in an area most representative of the climatic and soil conditions found in the western part of the United States. Six types of bituminous pavements built according to different specifications will be used. The roadway will be tested with increasingly heavier truck loads applied over a four-to-six-month period. Trucks used will conform to the tractor-trailer type instead of the shorter, single units used in the Maryland tests. Funds for the project will be provided by W.A.S.H.O. and the Highway Research Board will obtain contributions of personnel, equipment, materials or funds provided by the trucking and petroleum industries, the Bureau of Public Roads and the Department of Defense.

# The Maryland Asphalt Extractor

Larger samples are given major credit for more accurate and consistent check on asphalt content of mixes with the special equipment here pictured.

By J. Eldridge Wood

Materials Engineer, and

William T. Long

Materials Department, Maryland  
State Roads Commission

IN the design of the modern flexible pavement much care is exercised in specifying certain gradation limits for the aggregate and the quantity of asphalt which is considered to be the optimum consistent with stability and durability. Although it is general practice to maintain close inspection at the asphalt plant to ascertain that there has been close compliance with the specifications, the ultimate information desirable is a confident knowledge of the actual composition of the material which is to be placed on the road.

Several methods have been employed during the past years to accomplish this analysis, among the most popular being the centrifugal method of extraction commonly referred to as the "Rotarex" method and described under Test Method T-58 of the American Association of State Highway Officials. Very excellent results may be obtained by using this device and especially when the material is composed of fine aggregate and is of a comparatively homogeneous nature. The nominal capacity of the Rotarex is 500 grams of material or a little over a pound.

With the advent of the popularity of bituminous concrete using a larger size aggregate, it was found that greater difficulty was encountered in obtaining a representative sample when only 500 grams or so of the material could be used for extraction. In view of this condition various methods were explored in an effort to find some means by which laboratory results obtained could be translated to the overall composition of the mix as actually placed on the road.

The equipment and method about to be described represent a cooperative project engaged in by several members of the Maryland State Roads Laboratory. It was decidedly not a drafting room job; the first extractor was made from rough sketches and

verbal instructions were furnished a sheetmetal man for its fabrication. Several minor modifications have since been made, and it is freely admitted that additional refinements can and may be made which may facilitate the general operation and possibly add to its overall efficiency.

## General Description of Equipment

The three principal components of the extractor consist of a box or kettle type boiler, a basket or sample holder assembly, and a condenser cover. Figure 1 shows a sketch projected isometrically of the compo-

nents of the extractor.

The incidental equipment is easily obtainable and would generally be found in any moderately equipped materials testing laboratory. Besides necessary screens for grading, the following pieces of apparatus should be available:

Scale—10,000 gm. capacity—1 gram sensitivity.

Balance—1,000 gm. capacity—0.1 gram sensitivity.

Gas burners.

Muffle furnace.

Graduates (1—250 ml and 1—2000 ml).

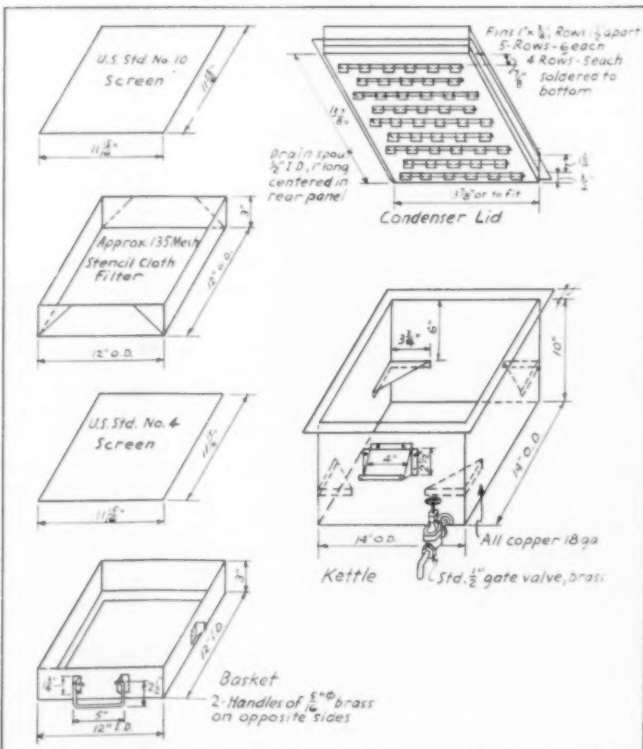
Porcelain spatula.

Putty knife.

Long handle paint brush—Fitch Type.

## Procedure Outlined

A detailed account of the procedure involved is contained in a paper

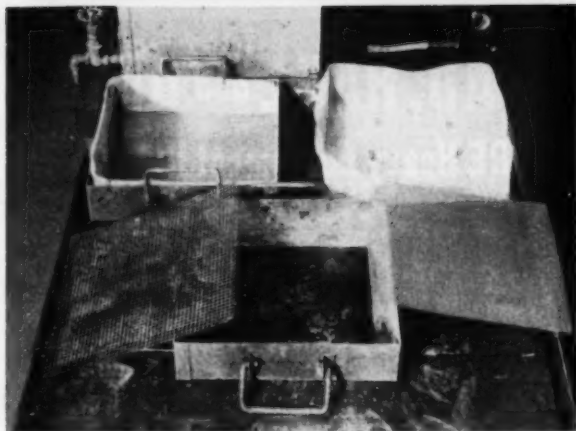


★ Figure 1. The "Maryland Extractor" sketched from working model





★ Figure 2 (Left): In foreground is shown the mix as it is removed from the shipping container. In the background is an extricator with the condenser cover removed and charged with a bituminous mix ready to be extracted.



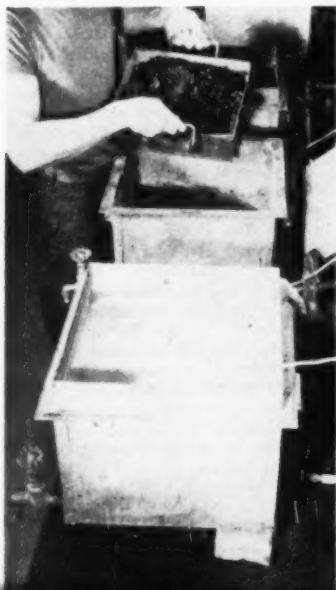
★ Figure 3. (Right): Here is shown the components of the extricator's "basket." The No. 4 screen is used for a support. The No. 10 screen is used to overcome the abrasive action of the sample on the cloth filter. There is also shown in the left background an assembled basket.

on this subject by the senior author, presented at the 1949 Detroit meeting of the Association of Asphalt Paving Technologists. It is published in the 1949 Proceedings of that organization.<sup>1</sup>

Briefly the operation consists of securing approximately a 15-lb. sample, carefully selected to be representative of the bituminous mix. This

<sup>1</sup>1949 Convention Proceedings, The Association of Asphalt Paving Technologists, P. O. Box No. 376, Ann Arbor, Michigan; price \$4.00.

★ Figure 4. (Left below): A closed extricator ready for operation is shown in the foreground. To rear is shown filled basket being placed in extricator.



is properly identified and delivered to the laboratory in a corrugated paper carton 9" x 9" x 3", where it is weighed to the nearest gram and placed in the extricator with approximately 0.5 gal. of carbon tetrachloride. The extraction of the asphalt is accomplished in approximately two hours during which time the carbon tetrachloride is vaporized, by means of a gas flame, condenses on the fins of the cover and percolates down through the mix extracting the bitumin during the process. The oper-

★ Figure 5. (Center below): After extraction is complete, a sample of the filtrate is removed to determine the amount of fine material that has passed through the filter cloth.



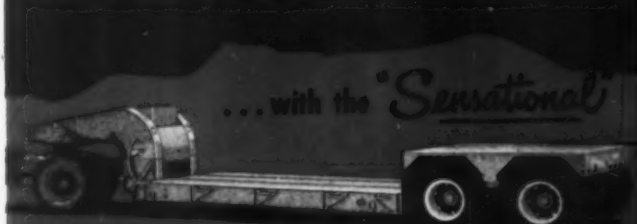
ation is assumed to be complete when a piece of absorbent paper shows no stain when placed in contact with the extracted aggregate in the basket. The bitumin free aggregate is weighed and a correction added to account for the amount of "fines" that has passed through the filter cloth with the asphalt. From the difference between the corrected weight and the original weight, the per cent asphalt in the mix is calculated. The extracted aggregate is then transferred to appropriate screens and graded for com-

61

★ Figure 6 (Right below): The fine aggregate has been graded and compared with the requirement of the job mix formula. There is also shown a basket with dry extracted aggregate ready for screening.



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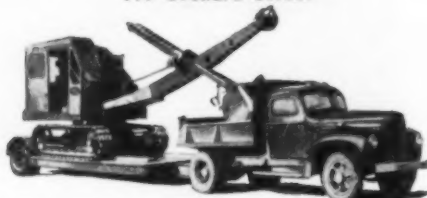


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pliance with the applicable specification or job mix formula.

### Discussion of Method

From the foregoing, it is quite obvious that there is nothing new as to the principles involved in this method. The good results which we have obtained with this type of extractor is largely due, we feel, to the quantity of sample used. During the past several years, a number of tailored mixes have been prepared in our laboratory in connection with a study of bituminous concrete design. The individual batches weighed approximately 5000 grams and after all tests on each mix had been completed, the various mixes were extracted. The results obtained were in very close agreement with the components actually weighed into the batches. The average variation from the amount of asphalt actually used and that found by extraction varied by less than 0.1%. Again in a series of cooperative tests sponsored by the National Slag Association, the extraction method just described proved its merit in producing results in close agreement with the composition as formulated in their laboratory. Subsequent cooperative tests have demonstrated that good results are obtained when a sample, sufficiently large as to be representative, is used.

In our laboratory we have increased efficiency by having extra basket assemblies on hand so that the extractor may again be placed in use pending the drying and gradation of the aggregate from the previous operation. The complete cycle can be accomplished in between three and four hours so that two operators working as a team can complete twelve extractions in one 8-hour day. However, this is working under forced effort. A more conservative estimate, including calculation and report of results, would be an average of 1½ extractions per extractor per day, using two technicians and six extractors.

At current prices the cost for the complete extractor fabricated by a private sheetmetal concern is around \$75.00. The cost per extraction for the carbon tetrachloride, fuel, etc., would be about \$.75.

The method described can successfully be used only with mixes containing asphalt, as the solvent carbon tetrachloride does not adapt itself to the extraction of road tar. It should also be emphasized that carbon tetrachloride is not suitable as an extraction medium if recovery of the asphalt for tests for deterioration of the asphalt is desired.

(Continued on page 78)

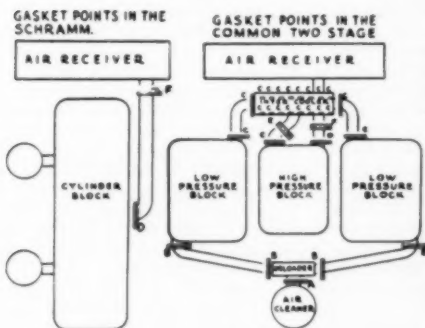
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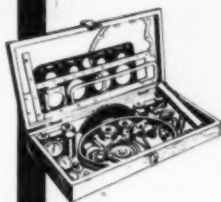
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# Qualitative Review

## of Minnesota's 1950 State Highway Bituminous Program

"How well did we do?" is the spirit of this post-season analysis, which discusses types of projects included, kinds of conditions corrected, degree of smoothness and density obtained, and factors in job control

**D**URING the 1950 construction season approximately 24,230,000 gal. of liquid bitumen and 26,600 tons of asphalt cement were applied on state trunk and county F.A.S. projects, under direction of the Minnesota Department of Highways. This article reviews the types of construction involved, presents data on the roughometer readings and densities achieved, and briefly considers some aspects of the control problem. The article is based on a report made in April, 1951, by G. A. McPherson for use by the highway department personnel.

Table I shows the various types used, and mileages of each. For convenience each type is referred to by the Minnesota classification code number for that type, described as follows:

### Minnesota Road Types

No. 2331 consists of a gravel-asphalt cement mixture in which the aggregate is introduced into the mixer as a single aggregate.

No. 2341 consists of a gravel-asphalt cement mixture in which the aggregate is divided into two or more sizes (usually two) before introduction into the mixer. Aggregate specifications are as follows:

	2331	2341
Per cent passing $\frac{3}{8}$ " sieve	100	100
" " " $\frac{5}{8}$ " "	95-100	95-100
" " " $\frac{3}{4}$ " "	65-95	65-99
" " " No. 4 sieve	50-70	
" " " No. 10 "	35-65	35-55
" " " No. 40 "	10-35	10-30
" " " No. 200 "	1-7	1-7

Where these mixes are used in urban work, and on rural work where the traffic justifies it, mineral filler is added so that the percentage passing the No. 200 sieve is increased to 4 to 8 per cent of which not less than 50 per cent must be mineral filler.

No. 2351 is the usual asphaltic concrete mixture involving the use of

crushed rock aggregate, mineral filler and asphalt cement. The aggregate is divided into at least 3 sizes in addition to the mineral filler. The wearing course grading must conform to the following requirements:

Per cent passing $\frac{3}{8}$ " sieve	100
" " " $\frac{5}{8}$ " "	98-100
" " " $\frac{3}{4}$ " "	70-85
" " " No. 4 "	50-65
" " " No. 10 "	35-50
" " " No. 40 "	15-30
" " " No. 80 "	8-16
" " " No. 200 "	4-8
Asphalt cement	5.5-6.2

All of the above mixes are of the hot-mix hot-lay type.

No. 2321 consists of the usual mixed-in-place construction in which aggregate in place on the road is mixed with cutback asphalt, tar or slow-curing oil by blade or travel-plant methods.

No. 2207 consists of the stabilization of the upper portion of a granular base, by mixed-in-place methods using cutback asphalt or road tar.

No. 2357 consists of a light seal coat of RC cutback asphalt, asphalt emulsion or tar in an amount of approximately 0.1 gal. of bituminous material and an application of 8 to 10 lb. of sand cover material per sq. yd.

No. 2356 refers to an application per sq. yd. of approximately 0.2 to 0.25 gal. of RC cutback, asphalt emulsion or tar and 20 to 25 lb. of stone chips or pea gravel graded from  $\frac{1}{2}$  in. to No. 10 sieve.

The fog seal coat, without cover, referred to, consists of the application of 0.05 to 0.07 gal. per sq. yd. of bituminous material with no cover aggregate added.

The "penetration prime" referred to in table II is used on well consolidated bases having little or no loose material, and consists of the application of 0.15 to 0.3 gal. of cutback asphalt or tar prime to the gravel base.

In cases where the surface of the base is not well consolidated and a layer of loose base aggregate is present, a mixed prime is used which con-

sists of mixing cutback asphalt or tar with such loose aggregate, by road-mix methods, to provide a bituminous surface upon which to place the plant-mix surface.

### How Types Are Used

On old concrete bases the surfacing consisted of a two-course construction with additional spot leveling and repair of badly broken up areas with new concrete base. On some projects a gravel base was first constructed over the old concrete pavement and existing shoulders to the width desired.

On the projects where surfacing is listed as being placed on the old bituminous mat, areas of weakness were strengthened with gravel base or leveling course in addition to spot leveling over rough and distorted areas. In all cases a  $1\frac{1}{2}$  in. wearing surface was placed.

The columns headed "Penetration Prime" and "Mixed Prime" in table II include all projects which were built over new gravel base. The surfacing in all of these cases consisted of a  $1\frac{1}{2}$  in. wearing course.

The roughness index is measured by means of a road roughness indicator. The machine was built on the basis of plans furnished us by the Bureau of Public Roads. The machine is described in the 1940 Proceedings of the Highway Research Board. The same machine has been used by the Virginia Highway Department and by Professor Moyer in California. The machine measures roughness in inches per mile and consists of a single-wheel trailer towed by car or truck.

An analysis of Table II indicates that it is reasonable to expect a roughness index in the low 60's or the high 50's with new surfacing on either an old concrete slab, old bituminous mat or a penetration primed base. It does not appear that there is much to choose from in the riding qualities which were obtained on these three types during the past year.

On only 5 projects out of 24 (or 21%) constructed on bases of the types shown in the first three columns, was the roughness indices over 65 in. per mile. Two of these projects were on county roads. The county engineer has since advised us that on projects



**Table I. Types and Projects in Minnesota 1950 Program**

Type of Construction (Miles)	Construction Division	Maintenance Division Contract	State Forces	F.A.S. (County)	Totals
(2351) Hot Asphaltic Concrete	4				4
(2341) Hot Plant-Mix Surface	28				28
(2331) Hot Plant-Mix Surface	384	2		7	393
(2321) Road-Mix Surface	138	247	577	211	1173
(2207) Pitt. Stabilized Base	44	75	59	36	214
(2357) Light Seal with Cover	387	953	523	7	1870
(2356) Heavy Seal with Cover	8	7		56	71
Fog Seal without Cover	180	117	43	118	458

of this type he intends to provide more spot leveling in an attempt to lower the relatively high roughness readings which were obtained on his work.

Of five projects on which the surfacing was placed over a mixed prime, three, or 60%, recorded a roughness index in excess of 70 in. per mile. A mixed prime is usually used on projects where one of the following conditions exists:

1. High traffic counts which must be carried on some of our projects during the construction operations.
2. The gravel base as constructed does not "wear well" under traffic because of the "light" characteristics of the binder soil and gravel available for use.

Some of the factors which may have contributed to the relatively higher roughness indices recorded on the three "mixed prime" in table II are:

1. Insufficient curing time allowed for the mixed prime course before laying the wearing course. If the mixed prime course has not cured sufficiently the placing of the hot plant-mix wearing course may cause mixed prime to become unstable due to the volatile material still present in the mixed prime course. This could result in a wavy surface being obtained under rolling.
2. Where patching of the mixed

prime is necessary ahead of the paving operations, it has often been noted that not enough care is exercised in the patching of the mixed prime. This operation should be done well in advance of the paving operation, at least a day or two days in advance, and not just ahead of the paver. In patching the mixed prime, more care should be given to the matter of rolling the patch material after placing. It has been noted in some cases that no attempt was made to roll the material after

Roughness indices obtained during the 1950 season on hot plant-mix surfaces varied from a high of 83 in. per mile on a project which was placed over a crushed rock base which had been penetration primed, to a low of 50 in. per mile on a project which was placed over an old mat which had been appreciably bettered before placement of the wearing surface by an almost continuous leveling course to correct crown and distortion in the old mat.

As indicated in Table III we should expect values below 60 in. of roughness per mile on the major part of our future construction.

The analysis of roughness indices as shown in Table II indicates that practically all contractors working on this type of work did build reasonably smooth surfaces.

For purposes of comparison, Table IV lists all road-mix surfaces on which roughness readings were taken during

**Table III. Hot Plant-mix Surfaces**

(Yearly Maximum, Minimum and Average Roughness Indices)

Year	No. of Miles	Maximum	Minimum	Average
1947	210	86	47	60
1948	200	86	48	60
1949	378	83	52	66
1950	395	83	50	61

patching. Rolling with the tires of trucks which haul the patch material is a simple operation and is considered to be satisfactory for this type of patching.

There does not appear to be any reason why wearing surfaces placed over mixed prime courses should be any rougher than those placed over other types of bases, as evidenced by the other two projects which show readings well within the desired range.

the year. This includes: 11 construction projects totaling 78 miles with an average roughness of 121 in. per mile, 11 county F.A.S. projects totaling 72 miles having an average of 123 in. of roughness per mile, 20 maintenance projects of which 6 were done by state forces and the other 14 by contract totaling 156 miles with an average roughness of 130 in. per mile. The overall average for 42 projects totaling approximately 305 miles is 126 in. per mile.

Practically all of the road-mix surfaces consisted of one course construction on the existing base.

On this type of surfacing it is apparent that a more satisfactory surface was obtained on the penetration prime bases than on the old mats and mixed prime surfaces. Only one project was placed over old concrete and had a roughness index of 103 in. per mile. The increase in roughness on the projects placed over the old mats can partially be explained by the fact that very little or no leveling was done before laying the wearing course. Surfaces placed over mixed prime bases undoubtedly show the higher roughness readings for the same reason as stated in the discussion of plant-mix surfaces.

The total of 42 projects included in this analysis were constructed by 19 separate contractors. Of these projects 13, or 31%, were in excess of 135 in. of roughness per mile and were built

**Table II. Roughness Index of Plant-mix Bituminous Surfaces (2331 and 2341)**

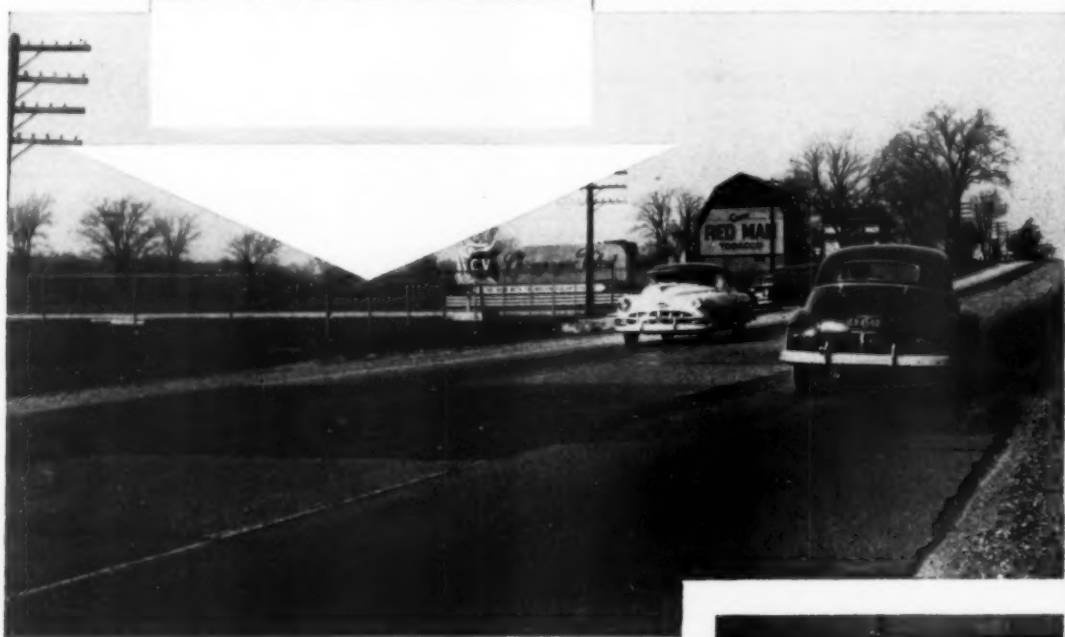
(Identified as to contractor and type of base on which surfacing was placed)

Type of Base Contractor	Old Concrete Miles	R.I.*	Old Bit. Mat. Miles	R.I.*	Pen. Prime Miles	R.I.*	Mixed Prime Miles	R.I.*	All Miles	R.I.*
A	29.6 <sup>1</sup>	61	140.8 <sup>8</sup>	57			11.9 <sup>1</sup>	72	182.3 <sup>10</sup>	59
B					11.3 <sup>1</sup>	61	26.8 <sup>2</sup>	71	38.1 <sup>3</sup>	68
C			32.2 <sup>1</sup>	56	10.1 <sup>1</sup>	59			42.3 <sup>2</sup>	57
D					10.7 <sup>1</sup>	83			10.7 <sup>1</sup>	83
E			9.2 <sup>1</sup>	60	8.6 <sup>1</sup>	56	10.1 <sup>1</sup>	57	27.9 <sup>3</sup>	58
F					14.8 <sup>2</sup>	58			14.8 <sup>2</sup>	58
G			16.9 <sup>3</sup>	75					16.9 <sup>3</sup>	75
H					9.8 <sup>1</sup>	58			9.8 <sup>1</sup>	58
I	10.5 <sup>1</sup>	53							10.5 <sup>1</sup>	53
J	8.0 <sup>1</sup>	65							8.0 <sup>1</sup>	65
K			9.8 <sup>1</sup>	68			24.0 <sup>1</sup>	61	33.8 <sup>2</sup>	63
Totals and Average	48.1 <sup>3</sup>	62	208.9 <sup>14</sup>	59	65.3 <sup>7</sup>	62	72.8 <sup>5</sup>	66	395.1 <sup>29</sup>	61

\*Roughness in inches per mile. 1 Number of projects represented.



# ANNOUNCING-



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by 9 of the 19 contractors involved in this type of construction. Eight of the above mentioned 13 projects were built by 4 of the 9 contractors who built projects in excess of 135 in. per mile. This would seem to indicate that the majority of the contractors performing this type of construction can be expected to furnish equipment and operators which could give a riding surface with a roughness index of less

**Table V. Permissible Coefficient of Variation in Per Cent of Average**

Item Spec.	%"	±4 Gradation	±10	±40	Content Bitumen	(Density) Compaction
2351	4	10	13	13	7	2
2331	4	6	8	13		
2341	4	6	8	13		

11 construction projects placed under Specification 2321 (Road-Mix) during

1950. An average roughness of 121 in. per mile was obtained. This reflects an increase of all in. per mile over 1949 for road-mix.

From the above figures it can be seen that the plant-mix surfaces, placed during the 1950 season, will average 60 in. smoother than the road-mix surfaces on the trunkhighway system built by the construction division. This represents a considerable increase in the spread between the two types of surfacing, as compared to 1949 when the difference was only 43.6 in. per mile. Some of this difference can probably be accounted for by the often heard statement in the field, "What has happened to all the good blademans we used to have?"

As stated in various bulletins to Minnesota state highway department personnel, it may be said that the designed thickness of mat was obtained as measured by the rate of spread per square yard.

#### Kinds of Bitumen Used

In hot plant mixtures, asphalt cements were used on all but five projects. On these five projects slow curing oil (SC-5) was used. The asphalt cements used varied in penetration from the harder asphalts (60-70 penetration) used in hot asphaltic concrete to the softer asphalts (200-300 penetration) used in the Single Aggregate Type (2331).

It was necessary to use a coating aid or anti-stripping additive on three

**Table IV. Roughness Index of Road-mix Bituminous Surfaces (2321)**

*Identified as to contractor and type of base on which surfacing was placed*

Type of Base Contractor	Old Concrete Miles R.I.*	Old Bit. Mat. Miles R.I.*	Pen. Prime Miles R.I.*	Mixed Prime Miles R.I.*	All Miles R.I.*
1			9.2 <sup>1</sup> 108		9.2 <sup>1</sup> 108
2			6.5 <sup>1</sup> 103		6.5 <sup>1</sup> 103
3		9.2 <sup>1</sup> 136		7.7 <sup>1</sup> 165	16.9 <sup>2</sup> 150
4			9.3 <sup>2</sup> 107		9.3 <sup>2</sup> 107
5			5.8 <sup>1</sup> 102	24.1 <sup>2</sup> 197	29.9 <sup>3</sup> 106
6		17.2 <sup>3</sup> 138		10.0 <sup>1</sup> 137	27.2 <sup>4</sup> 138
7			13.6 <sup>2</sup> 119		13.6 <sup>2</sup> 119
8				23.7 <sup>2</sup> 143	23.7 <sup>2</sup> 143
9				10.8 <sup>1</sup> 117	10.8 <sup>1</sup> 117
10				26.6 <sup>4</sup> 134	26.6 <sup>4</sup> 134
11			12.0 <sup>3</sup> 118		12.0 <sup>3</sup> 118
12				3.0 <sup>1</sup> 156	3.0 <sup>1</sup> 156
13				3.9 <sup>1</sup> 142	3.9 <sup>1</sup> 142
14	5.0 <sup>1</sup> 103				5.0 <sup>1</sup> 103
15			6.0 <sup>1</sup> 132	11.5 <sup>1</sup> 128	17.5 <sup>2</sup> 129
16		8.8 <sup>1</sup> 127		5.0 <sup>1</sup> 132	13.8 <sup>2</sup> 129
17			5.6 <sup>1</sup> 98		5.6 <sup>1</sup> 98
18		9.5 <sup>1</sup> 147	5.4 <sup>1</sup> 154	5.6 <sup>1</sup> 98	20.5 <sup>3</sup> 135
19		19.8 <sup>2</sup> 116	9.1 <sup>1</sup> 134	21.5 <sup>3</sup> 131	50.4 <sup>6</sup> 126
Totals and Average	5.0 <sup>1</sup> 103	64.5 <sup>8</sup> 134	82.5 <sup>14</sup> 117	153.4 <sup>19</sup> 130	305.4 <sup>42</sup> 126

\*Roughness in inches per mile. 1 Number of projects represented.

than 125 in. per mile. An analysis of Table IV indicates that 9 of the 19 contractors who built 15 of the 42 projects had no roughness indices in excess of 124 in. per mile with the low being 98 inches per mile and the average being 110 in. per mile.

#### Riding Qualities of Plant-mix Versus Road-mix

For purposes of this comparison, only the projects placed by the construction division will be used, as much of the maintenance work is usually of a temporary nature and is placed in short stretches and over weak sections of base.

The average roughness index of all hot plant-mix bituminous surfaces recorded for the 1950 season was 61 in. per mile and represents 395 miles. Roughness recordings were made on

**Table VI. Comparative Yearly Averages of the Coefficient of Variation, 1947 to 1950**

Year	%"	Gradation No. 4	No. 10	No. 40	Bitumen Content	Compaction (Density)
		(2351 Hot Asphaltic Concrete)				
1947	7.00	8.75	13.25		5.10	2.08
1948	6.20	6.20	8.00	14.80	7.60	1.88
1949	6.13	7.88	7.25	13.50	4.84	1.20
1950	3.67	10.17	13.00	12.83	5.75	1.54
		(2341 Hot Plant-Mix Surface—Divided Aggregate)				
1947	5.50	10.83	24.50		11.82	2.98
1948	5.25	6.88	10.63	14.87	14.87	2.25
1949	4.14	5.57	9.71	12.86	7.55	2.62
1950	3.44	5.88	7.31	13.25	7.72	1.71
		(2331 Hot Plant-Mix Surface—Single Aggregate)				
1947	4.14	9.33	13.43		12.01	2.28
1948	5.30	7.19	9.48	13.59	11.22	3.35
1949	5.47	7.91	9.52	15.30	6.27	2.60
1950	3.94	6.03	7.45	13.25	6.12	1.91
		(All Types of Mixtures)				
1947	4.77	9.55	15.56		11.02	2.28
1948	5.40	7.00	9.53	14.00	11.50	2.92
1949	5.40	7.64	9.25	13.56	6.18	2.42
1950	3.81	6.34	7.88	13.22	6.44	1.83

projects constructed during the past year. Preliminary tests made on the aggregates to be used on these jobs indicated that a mixture using these aggregates would result in a low density and thereby have unsatisfactory resistance to water action as indicated by the rather high losses recorded in the "Cold Water Abrasion Test." The use of the additive in the preliminary tests appreciably lowered the "Cold Water Abrasion" losses to a point where the mixture was considered to be satisfactory. On one of the above mentioned projects an aggregate having approximately 7% shale was used. On the other two projects the per cent of voids filled in the mat fell below the desired minimum. This openness (lack of density) in the mat invites air and water action. However, by the use of the treated asphalt and an adequate seal coat it is felt that a surface of satisfactory durability was obtained.

An analysis of the field checks and laboratory extraction results indicate that the extraction results yield a higher bitumen content than is reported from the field in 24 cases with an average plus variation of 0.11%. The maximum plus difference was 0.31%. In 54 cases a lower percentage was obtained by the extraction than was reported from the field with the average for the 54 cases being 0.23%. The max. minus difference was 0.76%.

The preponderance of cases which under-run the field reported percentage can be partially attributed to the fractions of the asphalt cement which are absorbed into the gravel and cannot be recovered. In the cases where the extracted percentages are higher than the field percentages, it must be assumed that some of this variation is due to sampling procedures and natural variation in plant operation.

The importance of plant calibration before the start of mixing operations cannot be over-emphasized. An accurate and complete calibration of the mixing plant before the start of operations will enable the inspector or engineer to determine gate openings and proper pump settings or scale setting, to obtain the desired mixture. A calibration must be made for each different source of gravel material used.

"Spot checks" on the asphalt content are of major importance in the progress of the work as they serve as a means of check on the asphalt content of the mixture. The "spot check," accurately made, is one of the best controls of the asphalt content which the inspector has. The "spot check" can be made in a comparatively short time and represents a small amount of mixture (50 to 70 tons), which is approximately 30 minutes of operating time.

The average aggregate gradation

for each project indicated that requirements were generally met, with the exception of two cases where the requirements on the #200 sieve were slightly exceeded and one where the test results on the #10 sieve were slightly high. In one case where the percentage passing the #200 sieve was high on the field tests, the laboratory and extraction gradations were within requirements. As a general rule, gradation tests on the aggregate samples run in the field and in the laboratory and gradation tests on the extracted samples are in reasonable agreement where enough tests were made to get a representative average.

#### Density of Mat

As stated in previous bulletins the density of the mat is of prime importance, to furnish a tight, impermeable surface to protect the subgrade and provide a surface which is resistant to weather and traffic action.

One short project placed in the latter part of September on a city street has shown evidence of lack of density as indicated by rather severe raveling and disintegration of the mat. A study of the reports submitted by the project engineer during construction indicates that insufficient rolling was done on the sections of the mat which are showing the greatest deterioration.

Most of the raveling and disintegration started at the longitudinal lap of two adjoining lanes. This can be attributed to insufficient rolling of the longitudinal lap and not building the adjoining strip slightly higher at the joint to enable the roller to effectively consolidate this section of the mat. It becomes apparent that more and more emphasis must be placed on more and earlier rolling of the entire mat surface, particularly on our autumn work.

However, on the bulk of the work placed in 1950, it can be said that a satisfactory density was obtained. Too much emphasis cannot be placed on the necessity for earlier and more thorough rolling of the mat at the time of placement as the fall season progresses. An analysis of the jobs placed in the late fall indicates a reduction in density as the average air temperature decreases. While this decrease in density is not great, it indicates that more attention should be given to the rolling of the mat at such times. Failures in durability of mat can usually be attributed to lack of density.

#### Sealing the Surface

Hot plant-mix surfaces were sealed, with a few exceptions where the work was completed too late in the fall to satisfactorily apply the seal coat because of adverse weather conditions. On the projects which did not receive the seal coat as specified, a fog seal

was applied; the regular contract seal will be applied in 1951.

#### Job Control

Coefficients of variation on some of the items affecting the uniformity of the mixture in place, such as, gradation, per cent bitumen and density have been determined. The coefficient of variation represents a band (in per cent of the average) on each side of the average which will include approximately 70% of all individual tests making up the average. The smaller the coefficient, the narrower the band and better the control.

Based on data obtained from our own construction projects over the past two years, the following maximum limits have been determined for the coefficient of variation and are believed to be a reasonable figure. These limits are appreciably reduced from those given in previous bulletins and confirm the fact that better control is being obtained due to the added controls which have been incorporated in the specifications and the increasing familiarity of the field personnel with control methods and expectations.

Using the coefficient of variation as a basis for determining the degree of control which was obtained, it can be seen by an analysis of Table VI that the control has been improved considerably during the past four years.

It is apparent that there is general betterment of control (lowering of the coefficient of variation) on all items for the 2331 and 2341 classifications. In the case of the 2351 mixtures it is rather erratic, partially accounted for by the relatively few projects of this type, the small number of samples taken, small quantities of material represented, which results in an average based on too few determinations to give an accurate and reliable figure.

It can be seen that a definite betterment has been made in the variation on the No. 10 sieve in the case of the 2331 and 2341 types. This can partially be attributed to the new specification requirements which were used in part of the 1949 work and all 1950 work:

(1) The construction of a prepared stockpile of at least 1,000 tons of crushed aggregate ahead of the dryer.

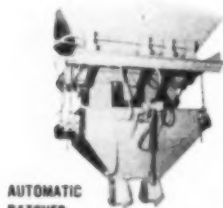
(2) The limitation on the running average on the No. 10 sieve.

Other factors entering into this apparent improvement of control are: a better knowledge of what can be expected by our field personnel, additional experience and "know-how" among contractors and engineers.

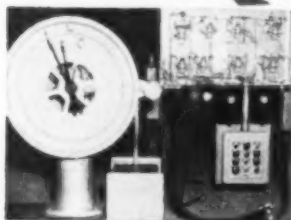
The foregoing article is based on a report made by G. A. McPherson, Bituminous Engineer, to the Division of Materials & Research, Minnesota Department of Highways.



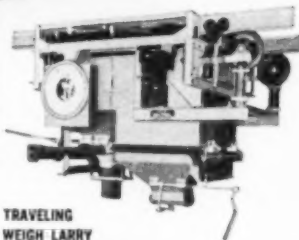
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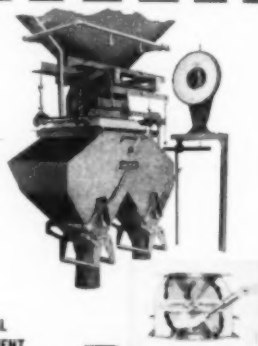
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## Oregon Seal Coating is Done Full Width

Prior to 1950 all sealing operations on Oregon state roads were conducted on the basis of spraying one-half of a roadway with asphalt at a time, followed by a truck in reverse, spreading aggregate to cover. A roller would follow. From  $1\frac{1}{2}$  to 1 mile of one-half roadway would be thus treated before returning to the other one-half of the roadway. Much time was lost in returning to the second half, in brooming and in traffic control.

Under the revised procedure the distributor is equipped with a full width (20'-24') spray bar. A spread of bitumen was made of a length which could be just covered by three aggregate trucks (about 675 ft.).

Before spraying, the three trucks equipped with tailgate spreaders were lined up behind the distributor, traffic stopped by flagmen and spraying started. Each truck covered its assigned one-third of the roadway, giving the distributor a slight head start. The trucks follow immediately behind, each truck dropping out to the right as its load is exhausted, the result being that the spread of asphalt is covered within seconds of its application to the surface. That point is not too important except as it emphasizes the speed with which this operation may be carried out. One of the important advantages is that the center joint is eliminated with the attendant defects which frequently accompany it such as a double application of asphalt which would bleed or a failure to meet the first shot, requiring hand application of asphalt and rock. This method can be organized on a production line basis and a completely finished seal job is left as the seal crew and equipment move down the road. In one District in which this method of operation was used, the conventional seal was placed at a saving of approximately \$300 per mile under a normal cost of about \$1,700.

An objection voiced in this method is that it results in a greater traffic delay than with conventional methods.

This question was discussed with the District Maintenance Superintendent who supervised the sealing operation described. Full width oiling actually results in less delay than half width type, if traffic is permitted to go through after each shot. His experience was that with sufficient trucks to cover a full width shot, they can cover faster than the distributor can lay asphalt. The method appears to produce a more uniform seal coat at a substantial saving in cost.

E. A. Collier is maintenance engineer, Oregon state highway commission.



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40V	1036	40x22	80	65500
39V	1036	30x18	80	56000
25V	1036	24x16	60	46000
24V	1024	24x16	60	42100
18V	1024	24x16	40	36700
17V	1016	24x16	40	32900

\* Diesel Electric Drive

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★ U.S. 40 near Elko, Nevada—example of full-width bituminous surfacing common in Nevada



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## Shoulder Paving Serves Several Purposes

**By J. D. Meacham**

Construction Engineer  
Nevada State Highway Department,  
Carson City

NEVADA has, for the past 15 years, been providing either roadmix or plantmix bituminous shoulders generally ranging from 2 to 2½ in. in compacted thickness on all construction and reconstruction projects. The low-traffic secondary highway projects are constructed with a 24-ft. width of roadbed and the entire roadbed is surfaced with a 2-in. compacted depth of roadmix bituminous material on an adequate base course of gravel or selected material. This practice results in obtaining a 20-ft. surface and two 2-ft. shoulders.

Regular routine maintenance activities are reduced since there has been no maintenance work such as building up shoulders, balding shoulders and weed cutting. The only maintenance work that has been required has been some minor patching and an occasional flush seal coat of asphaltic material at an average of about every 7 to 8 years.

The principal advantage, however, is not based on economy in maintenance cost but in the safety this type of stable shoulder construction insures to the traveling public. There are no soft or depressed shoulder conditions due to lack of adequate maintenance on this type of design and construction.

Another advantage reported for this type of construction was clearly evident during the heavy rains and flooded highways that occurred in western Nevada during November, 1950. Approximately 10 miles of highways were overtopped with high-velocity river water with maximum depth of water ranging from 3 to 4 ft. Where bituminous shoulders were provided on fills of 1 to 6 ft., the water washed out the slopes of fills at the edges of the bituminous shoulders, but most of the bituminous shoulders remained intact after the flood waters subsided. If the old-type gravel shoulders had been constructed, the flood-damage loss and repair work would have been greatly increased as the entire shoulder would have been lost. Flood waters had been running over main highways for from 3 to 4 days but highways with bituminous shoulders were put back into use at once after the peaks of the flood waters had subsided.

### Prevents Edge Seepage

▲ third advantage is the fact that shoulder-to-shoulder surfacing helps prevent seepage of moisture under the pavement edge. The protection is especially valuable during snow melting, when softening of the base often causes edge breakdown under traffic.

A costly maintenance item on most of the old 20-ft. roadmix bituminous surfaced highways in Nevada consists of building up low shoulders and taking care of breakdown of the low-type bituminous shoulders at the edge of the surface. This problem has been solved by building up an oiled shoulder adjacent to the 20-ft. bituminous surface two feet wide on either side. This amounts to providing a 24-ft. width of surface, with the result that very little traffic needs to travel on the untreated gravel shoulders.

Nevada, through the years, has developed a very ingenious and inexpensive method of building up and oiling shoulders 2 ft. wide. The method consists of placing approximately 0.4 gal. per sq. yd. emulsified asphalt with cinder or screening cover, 2 ft. wide along the shoulders at the edge of the old 20-ft. roadmix bituminous surface. The equipment used in Nevada consists of a 2½ yd. dump truck loaded with cinders or screenings which are dumped into a small 2-ft. spreader box. A spray bar having three nozzles is installed in advance of the spreader box. The dump truck tows a trailer-type 250-gal. oil distributor and hitched on the back of the oil distributor is a tow-type roller. The truck tows the entire assembly and a crew, consisting of two men, does all the work. The spreader box is a shop-made device which has a steel strike-off blade ahead of the box. A large steel pulley is used to weight down the strike-off blade so that it will cut into the shoulders approximately ¾ in. The cinders used give approximately three-fourths inch compacted thickness of oiled material which builds up the shoulders and prevents further edge breakdown of the old 20-ft. roadmix bituminous surface.

### Propane Gas Burners on Asphaltic Kettles

In spring of 1950 the Oregon State Highway Department installed Propane burners on two of their section maintenance patching kettles of 200-gallon capacity, operating from Salem, as an experimental project. Reports on the performance of these burners from the maintenance superintendent and equipment superintendent have been favorable and the following features are cited by F. W. Farrar,

District maintenance engineer.

1. Fuel cost is reduced 29 percent.
2. Will heat a full kettle of SC-6 to application temperature in 30 minutes—45 percent less time than with conventional fuel oil or kerosene burners.
3. There is substantial saving in cost of the burners themselves. First cost of a burner is 1/3 that of a fuel oil burner for the same piece of equipment and they have a useful life which is several times that of a conventional burner.
4. The burners are safer since the

fuel is instantly available in a combustible mixture. It does not have to be atomized and, therefore, eliminates some of the danger of flashback and explosion experienced with conventional burners.

So far, Propane burners have been used only in an area where district distributor service is readily available. Before the State can successfully use this fuel in the more remote areas, it will have to obtain special storage tanks and pumping facilities.

E. A. Collier is maintenance engineer, Oregon highway commission.



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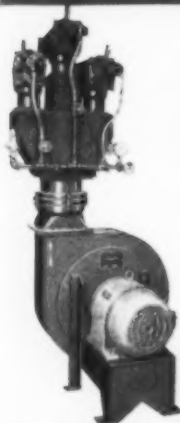
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## Cover Scene Depicts® California Seal Coat Methods

The BITUMINOUS ROADS AND STREETS cover scene this month illustrates one step in a project which the Editor visited some time ago with his camera.

The job was along U.S. 99 in Siskiyou, California. Morgan Construction Co. had this job, which totaled 31.7 miles of roadway 20 ft. wide. The work consisted of applying seal coat and cover stone, under California specifications for Class "A-Fine" which involves liquid asphalt. This is one of several specifications, another common one in this state being the Class "C-Fine" which uses emulsified asphalt. [April, 1950, **ROADS AND STREETS**]

### Change Order

Liquid asphalt grade SC-6 was used here, only .15 gal. per sq. yd. being applied due to lack of penetration into the old bituminous mat. A change order was approved, for this reason, to permit a substantial decrease (from 340 to 280 tons) of asphalt for the job, and to increase the chip application to 23 lb. per sq. yd.

Asphalt was applied with a distributor having a built-in retort plus a well designed and compact spray bar, which features combined to eliminate clogging to a very minimum.

Because of the irregularities in the existing road surface, special contract provisions called for a pneumatic-tired roller in lieu of a tandem roller usually specified. The results were reported good. As pictured (cover scene) a broom drag was given much credit for securing an exceptionally smooth riding surface. Additional screenings were applied at local areas where bleeding had developed in the old road surface. Total chip tonnage for the job, 4650 tons or 147 tons per mile for the job, applied 20 ft. wide.

### Watch Cool Nights

A point noted in the final report on this project was that temperatures fell as low as 33 deg. F during the nights, but that the weather warmed up quickly in the daytime. Seal applied during morning hours proved the most satisfactory, being specially superior to work done in the late afternoon when temperatures during the ensuing night fell below 45 degrees. Work was all performed during June and July.

Equipment furnished by the contractor for the project:

- 1—Cleaver retort (1 1/2-ton Chevrolet chassis)
- 1—Standard distributor, 1350 gal. (2 1/2-ton Reo chassis)



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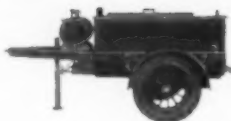


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- 1—Drag broom
- 1—Spears-wells power broom
- 1—Ford 6-yd. dump truck
- 1—GMC 6-yd. dump truck
- 1—Chevrolet 6-yd. dump truck
- 1—International 4-yd. dump truck
- 1—1/2-yd. Quick Way crane (on Coleman chassis)

The project was divided by the District II (Redding) staff of the Division of Highways, with H. H. Morgan as resident engineer.

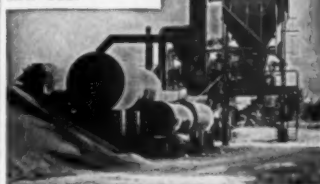
## Pre-mixed Bituminous Material Heater for Temporary Winter Patching

In some sections of California subject to continued cold wet weather during the winter, the Division of Highways, George Hellesoe, Maintenance Engineer, has been securing excellent results from the use of a portable heater for pre-mixed bituminous patching material.

The device, which resembles a miniature hot plant drier, is mounted on two wheels for towing behind a dump truck. The small drier is rotated by means of a small gasoline engine mounted on the frame. Heat is furnished by tank gas.

Pre-mixed material is shoveled from the truck bed through a hatch

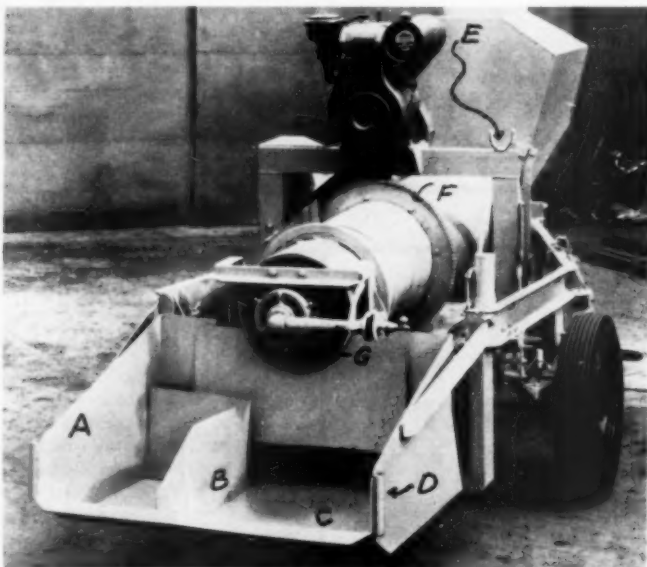
## ASPHALT PLANTS PORTABLE AND STATIONARY High Production— Low Cost



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NORRISTOWN, PENNA.

in the heater flue, and the dry heated material is discharged on a platform at the rear of the kiln.

In certain sections winter patching of the many miles of bituminous surfaced roads is a major expenditure. When cold material was used, patching was practically a continuous operation, with the patches, in severe weather, generally kicking out in twenty-four hours. Since the heaters have been available it is estimated that there is a saving of at least 40% in the amount of bituminous mix required for patching. Even under severe conditions, the majority of the patches last two weeks, and some of them become permanent. In addition, the hot material is easy to handle, and results in a superior surface on the patch.



★ Winter patch-mix heater developed by California maintenance department.  
(A) Sand hopper. (B) Removable partition. (C) Mix hopper. (D) Flag support.  
(E) Hook for hand torch and hose. (F) Split sprocket. (G) Burner.

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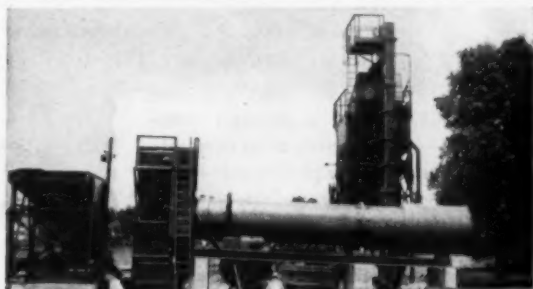
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Will Cut Your Costs...  
Increase Your Profit?"**

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Asphalt Plants Produce More—Faster—at Lower Cost!**



The improved, big-capacity *Cummer Dryer* is fast-producing, exceptionally efficient...Cummer Portable Plants are easily transportable—can be completely assembled in as little as 12 hours... No chain or belt drives—all moving parts are individually motor driven... Cummer Plants are complete power units with vibrating screen, mixer, dust elevator, enclosed cold elevator, cold storage bin and feeder... Fired with oil or gas

burners... Can be powered with Diesel engines... Available in sizes from 60 to 100 tons per hour... Axles and pneumatics may be furnished... Cummer Portable Asphalt Plants lead the field for sensible, modern design, rugged construction, low operating costs and continuous, profitable production. With a Cummer you *maximize* output...*minimize* overhead! Write for a Cummer Catalog today.

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# Here's where you'll find *Flex-Plane* users..



FLEX-PLANE is devoted exclusively to equipping concrete men with superior, cost-reducing tools and machinery. In this day of high material and labor costs, FLEX-PLANE mechanized equipment and accessories can more than ever save you money — let you do a better job at less cost. This means that you can enter lower bids without sacrificing quality.

Be sure you are up-to-date on the tools of your trade. Write **The Flexible Road Joint Machine Co., Warren, Ohio,** for a complete list of the latest concrete laying equipment.



## A.G.C. Groups Plan Disaster Methods

Detailed recommendations on how to plan for most effective operations of construction general contractors in clearing shattered areas and restoring essential facilities to use after an enemy attack by atomic bomb or otherwise were sent to the 112 local A.G.C. organizations by Managing Director H. E. Foreman.

The recommendations were prepared at the request of the Federal Civil Defense Administration and its predecessor organizations. Officials of the association spent more than a year studying the problem in cooperation with civil defense authorities. The recommendations are expected to be considered by the FCDA which is preparing manuals for the guidance of state and local civil defense agencies.

The report points out that no segment of our civilian life is so well equipped by its daily activities and training in civilian disasters to undertake this type of work as organizations in the construction industry. When there have been disastrous explosions, snows, floods, wind storms or others, the construction industry in the community and nearby areas has spontaneously mobilized.

## Asphalt Extractor

(Continued from page 62)

Attention should be directed to the fact that persistent breathing of carbon tetrachloride vapors, in itself, constitutes a serious health hazard. If the extraction is carried out in an open room with adequate ventilation and the operator exercises proper and diligent care in reducing his inhalations of these vapors to a minimum, it is felt that there is no cause for special alarm. This hazard, however, can be substantially eliminated by conducting the extraction under a well-ventilated hood or other device for efficient removal of the vapors incidental to the extraction. This latter method is recommended.

In conclusion, it should be emphasized that the method above described should not be used to take the place of constant and meticulous attention on the part of the plant inspector as to the quantity and quality of the components going into the mix. The State of Maryland relies on the results obtained from the extraction as a check of the quantities reported by the inspector on his plant report and in studying the composition of various proven pavements in evaluating and recommending formulas for new construction.

What's Behind The **Euclid** Name?



## \* **Dependability**

Euclids are engineered for the job... built for efficient, long life performance in off-the-highway service. In mines and quarries, on construction and industrial jobs, "Eucs" have earned their reputation for durability and low cost operation.

Plenty of power... large capacity for bigger loads... body designs for all types of materials... earth, ore, rock, or coal. Rear-Dump Euclids range in capacity from 10 to 34 tons, have diesel engines from 125 to 400 h.p. Bottom-Dump Euclids have capacities of 13 to 50 cu. yds., 20 to 40 tons with diesel engines to 300 h.p.

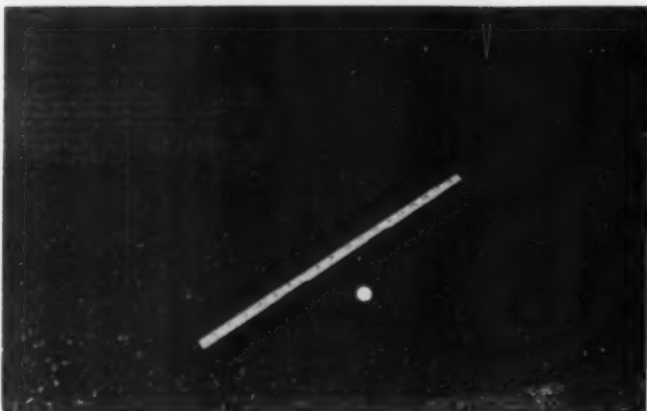
Repeat orders prove customer satisfaction. Owners say that "Eucs" actually cost less to own than any other hauling equipment. Euclid dependability will pay off on your present or future jobs. Write for complete information on the Euclid line, or call your distributor today.

**The EUCLID ROAD MACHINERY CO.,**  
CLEVELAND 17, OHIO

**MORE LOADS PER HOUR—  
MORE PROFIT PER LOAD**

# EUCLIDS





## New Road Material Allows Winter Road Repairs

A new road material has been developed by Koppers Company which it is claimed may be applied in any kind of weather, can be stock-piled in readily usable form throughout the winter and laid down without heating, using standard road-repair equipment. The new material, known commercially as Komac, is designed to be long lasting, in a field of use which ordinarily has involved only temporary patches that must be replaced in summertime.

Special binders for the material will be produced in limited quantities this fall, with additional facilities possible in time for the 1952 season.

★ Test road for new patch material, as seen after 4 months. Left side of the patch, made entirely across the road is the new material. Right side is ordinary road patching material. Both patches laid down at same time in winter.

★ Graphic comparison of the new road material with presently-used road materials is shown in this close-up photograph supplied by manufacturer. Patches customary material laid down side by side. After several months, as this photograph shows, new type mix remained firmly in place and did not bleed as warmer weather arrived. The circle (representing a quarter laid on the road surface) and the rule show size of the aggregate used in the new material.



## OVERMAN'S STONE AND BITUMINOUS SPREADER

**Well Pleased**—Said E. H. Coffin, County Highway Supervisor, with the Overman Spreader. It gives me a superior road, to any road-mix job and gives a road with top riding qualities at a minimum cost.

WRITE FOR BULLETIN

**I. J. OVERMAN MFG. CO.**  
BOX 203 MARION, IND.

## CUT ESTIMATING TIME with ROLATAPE

The NEW, QUICK Way to Measure Distances

- Measures as it rolls
- Easy to use
- Accurately calibrated

ROLATAPE accurately measures and records as you wheel it over distances to be measured. Model 200 illustrated records up to 100 feet, repeats cycle after ringing bell. Clearly audible click every two feet permits running count. Measures wall to wall, vertical, overhead and curved surfaces easily and accurately. Rugged steel construction withstands hard field usage. Easy to carry, weighs only 2½ lbs.

ROLATAPE pays for itself in a short time. Speeds up all kinds of estimating and layout work. No extra man needed to help with measurements. Order today to assure prompt delivery. Satisfaction guaranteed. **ROLATAPE, INC.,** 1415 14th St., Santa Monica, Calif.



ROLATAPE handles extends 34", yet folds compactly. Wheel is 2½" dia. Other models available for longer distances, rough terrain.



Only \$17.50

Fill out this coupon and mail today!

**ROLATAPE, INC., Dept. A, 1415 14th Street, Santa Monica, Calif.**

Gentlemen: Please send \_\_\_\_\_ ROLATAPE Model 200, at \$17.50 each.

Enclosed is ( ) check ( ) money order for \_\_\_\_\_

Money will be refunded if returned within 10 days.

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The new road material is made by mixing special bituminous binders with aggregates to form a premix. The resulting premix, pressed into chuck-holes of streets or roads, is said to make a long-lasting patch. E. O. Rhodes, special technical advisor to Koppers Tar Products Division, explains that the material represents more than two years of testing which included one of the most severe winters in a decade. The material was mixed and stock-piled during the fall. Test roads were built and test patches installed during cold winter weather in Michigan, Wisconsin, Pennsylvania, New York, and Massachusetts. In one state, he said, ice was cleared from a long stretch of road with salt, the pavement swept off and the Komac mix used for re-surfacing at 15 deg. F.

#### East Handling, Boon to Contractors

Special advantages of the material from their standpoint were noted by contractors who have assisted in making the tests. These advantages (again quoting Koppers) are: it is mixed cold in any type of mixing equipment. It can be stock-piled during the summer and fall at strategic places, and removed easily from the stock-pile in any kind of weather including coldest winter days. It does not adhere to hauling or spreading equipment. The material need only be tamped or rolled into the holes in the pavement. It can carry traffic immediately after it is rolled. The material does not "bleed" or push out of position in hot weather. And it shows great resistance to skidding.

#### With the Manufacturers And Distributors

**New Joy Distributors Named.** The Joy Manufacturing Co., Pittsburgh, Pa., has appointed the following distributors for Joy construction equipment: McCormick Machinery Co., 6501 E. Admiral Place, Tulsa, Okla., for the Tulsa area; The Townco Equipment Co., 1704 N.E. 6th St., Oklahoma City, Okla., for the Oklahoma City area; and Oehlert Tractor and Equipment Co., 201 W. Pacific, Salina, Kan., for the Salina area.

**Appointed Assistant Export Manager.** F. S. Battin has been appointed assistant export manager for The Thew Shovel Co., Lorain, O. Mr. Battin, well grounded in Lorain power shovels and cranes, has been with the company since the end of World War II and most recently was connected with the Central Territory of the domestic sales division of Thew.

**Velvac Appointed National Distributor.** The Cardinal Rubber Co., of Barberton, O., manufacturers of Cardinal long life safety mud guards, has appointed Velvac, Inc., 3530 W. Pierce St., Milwaukee, Wis., as national distributors for their line of motor truck and trailer safety equipment.

EVERYBODY'S SPREADING  
THIS GOOD WORD...



## BITUCOTE RS-2 For Surface Treatment

Engineers and contractors everywhere are learning first-hand about the easy-to-apply qualities of BITUCOTE RS-2... qualities that are resulting in faster jobs...lower labor costs...longer lasting wearing qualities.

BITUCOTE RS-2 EMULSIFIED ASPHALT will not run off high crowns, elevated curves, or steep grades.

BITUCOTE grips the aggregate rapidly and firmly...retaining a proper amount of aggregate, giving maximum performance and durability. This eliminates costly "bleeding."

RS-2 is safe, too. No hazardous petroleum solvents are used... no danger from flash-fires or explosions.

Let your Bitucote Representative show you how you can benefit by using BITUCOTE RS-2 EMULSIFIED ASPHALT now.

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Get the complete story on Bitucote. Send for your copy of 4-page Bulletin: "PAVE IT BETTER WITH BITUCOTE"—illustrated information on use of Bitucote for Road Mix, Penetration, Plant Mix, Surface Treatment, Base Stabilization.

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1411 CENTRAL INDUSTRIAL DRIVE • ST. LOUIS 10, MO.

Plants: St. Louis, Mo. • Cincinnati, O. • El Dorado, Ark. • Butler, Ind. • Laurel, Miss.

# 3 New Ways to Cut Costs with Le Roi TRACTAIR (Tractor-Compressor)

Tractair with its combination tractor-105 compressor feature and its many attachments has provided money-saving usefulness for contrac-

tors, utilities, and municipalities everywhere. Here are 3 new attachments that have already proved their ability to reduce costs:



## 1 Tractair Backhoe saves on small digging jobs

It gives you air power for breaking through pavement, frost, or running other air tools. Then the hydraulic backhoe takes over — does your digging fast and easy to a depth of 8 feet. Plenty of power for roots, broken concrete or hard ground. Digs straight end walls and loads to a height of 6'2".

## 2 Tractair Patch-Drill saves on pavement patching and trench opening

This unit consists of an air-feed Le Roi-CLEVELAND H-10 sinker (45 lb). It permits easy, fast drilling of a succession of holes. Then, using the same machine, all you have to do is broach out the web between the holes and lift out the entire section of pavement. There is no loading problem — no shoveling. Holes can be drilled and broached in an 8' radius. Tractair supplies air power, mobility, and, when equipped with front-end loader attachment, lifting power, too.



## 3 Tractair Multiple Tamper saves on tamping operations

Thanks to Tractair mobility, the tamping effectiveness of the Le Roi-CLEVELAND 3-Tamper arrangement and work-saving air feed, this unit can keep up with three men shoveling or a back-filling tractor. Not only is tamping faster and easier, but you also get better compaction and lower costs.

Learn more about the money-saving usefulness of Tractair for your own type of work. Send today for the 70-page, information-packed Tractair application book.

----- Tear out this coupon and mail TODAY! -----

### LE ROI COMPANY

Dept. R5-9, 1748 So. 68th Street, Milwaukee 14, Wisconsin

I want to know more about Tractair's ability to cut costs. Please send me your new 70-page Tractair Application Book.

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# Scrapers Do Big Skimming Job

**D**URING the past summer in West Virginia a pair of self-propelled scrapers, assisted by a dozer and a motor grader, performed an unusual grading job. The scene was the Ripley-Fairplain relocation on U.S. 21 north of Charleston, where the State road commission is reconstructing a crooked, hilly section of this artery for very heavy traffic. Keeley Construction Company, of Clarksburg, W.Va., had graded the road during the 1950 season.

The purpose of this year's scraper operation was to shave 0.4 to 0.6 ft. of material from the entire area of finished grade—some five miles long by 54 ft. wide shoulder to shoulder. Andersons, Inc., which took the surfacing and shouldering contract in May of this year, sublet this special task to Cash, Shaver and Green, contractors. The grade skimming was necessitated by a decision by the state road commission to build an unprecedentedly heavy 17-in. thick system of flexible pavement, base and subbase for the road's heavy traffic. For reasons of surface drainage and tying in to side roads at intersections, etc., lowering of the subgrade throughout was deemed advisable, in order that the pavement surface would be at the original design grade despite the extra thickness.

The removal proved to be a simple job, despite the hardness of the compacted clay and shale. A motor grader with scarifier teeth first loosened up tighter areas. Then two C Tournapulls with occasional pusher assistance and an Allis-Chalmers grader with scarifier cut, skimmed and dressed the job, the grader operator adding finishing touches here and there. This team moved about 1,000 cu. yd. of material per day, spoiling it at the nearest of several roadside locations. The skimming, conducted over a grade 54 ft.



★ Tournapull skimming the grade to meet a pavement design change. These two scrapers handled job with little dressing

wide, had to be performed skillfully in order to keep the grade in readiness at all times to shed rain water.

Of passing interest also was the 1950 grading job. Keeley Construction Company moved the entire 650,000 cu. yd. between July and December, with a peak month of 160,000 cu. yd.

Tractor-drawn scrapers were used to open up all cuts, followed by self-

propelled scrapers until rock was encountered. Shovels and scrapers then alternated as required to complete the work, scrapers handling softer material found between rock layers. The equipment included 7 tractors (some with dozers); 4 scrapers, tractor-drawn; 4 scrapers, self-propelled; 1 ripper; 4 sheepfoot roller units; 1 shovel, and rock drill equipment.

84

★ Allis-Chalmers HD-19 tractor helping scraper take a thin skimming cut in hard, compacted soil

★ Ford truck dumping base gravel and Allis-Chalmers motor grader spreading





On this highway job between Bardstown and Fredericktown, Ky., a 1 1/4-yd. Thew Lorain shovel, powered by a "Cat" D13000 Engine, loads heavy rock into Athey wagons, pulled by "Caterpillar" D7 Tractors. The contractor is W. C. Snyder, Danville, Ky.

# There's a big job ahead

How your equipment stands up in the months ahead has a real bearing on America's fight to be strong and stay free. A vital part of that effort is the \$12,000,000,000 worth of earthmoving and road building needed this year. And we're entering a period that will separate "the men from the boys" in the field of construction machinery.

Military needs and Defense Rated Orders are taking their share of "Caterpillar" production. Shortages of steel and other materials add to the difficulty of supplying the demand for new machines. This means that *present equipment must be kept in use.*

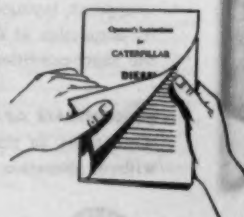
"Cat" Diesel Engines, Tractors, Motor Graders and Earthmoving Equipment are built with the stamina to serve you long and faithfully. But *how* long is up to you and the operation and maintenance you give them. Good care pays off.

You can add many hours to equipment life if you follow sound maintenance practices. Anticipate your parts needs *before* wear goes beyond repair. Talk it over with your "Caterpillar" dealer. He is qualified to give competent opinion. If a part is not readily available, he has the tools and knowledge to rebuild many worn parts — and keep your machinery on the job.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

## You're the Doctor

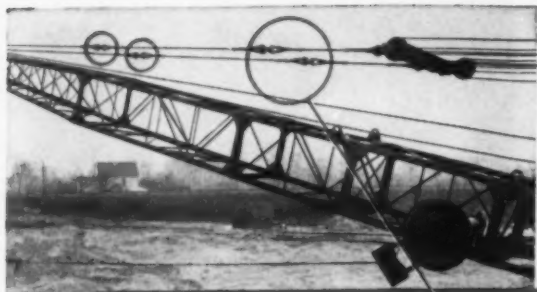
Don't let your engine overheat. Maintain the cooling system, keeping it free of scale, rust and sediment. Use soft or treated water and, when freezing temperatures exist, protect your engine with anti-freeze. Clean the radiator periodically, removing foreign matter from the core by brushing or washing. Use chemical flushing solutions. Prevent engine troubles which come with overheating. Consult your Operator's Instruction Book.



# CATERPILLAR

DIESEL ENGINES  
TRACTORS  
MOTOR GRADERS  
EARTHMOVING EQUIPMENT





# DUALOC BOOM CABLES



**ONLY the New DUALOC gives you these**

## 4 IMPORTANT ADVANTAGES -

**1 PREVENTS FATIGUE FAILURES.** Complete flexibility with Double Hinging action. No place for hidden and unexpected failures to happen from vibration.

**2 COMPLETE, ACCURATE INSPECTABILITY.** No wrappings, tapings or solderings. Completely open for inspection at any time. You can always know the exact condition of your Boom Cables.

**3 COMPLETE ADAPTABILITY.** Endings have same dimensions as zinc sockets—can be installed without alteration to present equipment.

**4 NO LOWERING OF WIRE ROPE STRENGTH.** Strength in all parts equal to full catalog strength of the wire rope. You have all the advantages of these assemblies with full assurance of all the strength built into your equipment by the manufacturer.

**DUALOC Boom Cables are ACCO-Registered.** This is assurance of highest quality workmanship combined with top quality material—Preformed Green Strand Improved Plow Steel Wire Rope.



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WIRE ROPE SLING DEPARTMENT**

*In Business for Your Safety*

**DUALOC  
BOOM CABLE  
ASSEMBLIES**

# Notes on Equipment and Materials For ENGINEERS AND CONTRACTORS

## Arc Drive for Welders

A new arc drive control to produce electrical transient characteristics desirable for certain welding operations now is available on Type RA selenium rectifier welders, manufactured by Westinghouse Electric Corporation. Arc drive permits the operator to adjust the arc characteristic of the welder to suit a particular job. The device operates automatically and in-

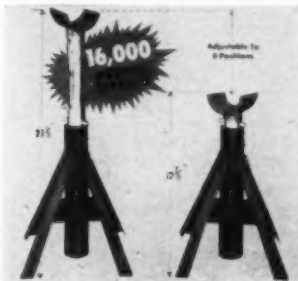


New Arc Drive

stantaneously to provide an extra surge of welding current at the moment the arc becomes shorted, either by contact between the electrode and the work or by a globule of molten metal bridging the arc gap. This extra surge of current helps clear the arc path and prevents arc outage or sticking of the electrode. Violent and prolonged overshoots and undershoots of welding current are eliminated. Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa.

## Truck Trestle

An all purpose truck trestle with a 16,000 lb. capacity by test has been introduced by Unit Manufacturing Co. Called the Unit utility horse, the trestle is adjustable to six positions using a positive locking pin arrangement. The horse stands

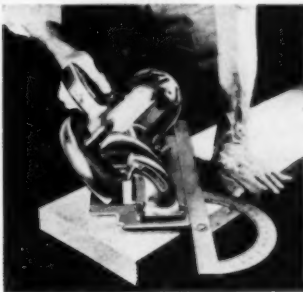


Unit Utility Hoist

21½ in. high extended, 12½ in. with the tube sleeve lowered. A 10 in. x 10 in. base offers positive footing, and the unit's cylinder sleeve extends 2 in. above the legs for added bracing. The tube sleeve cannot be lowered until weight is removed. Unit Manufacturing Co., 1229 Harmon Place, Minneapolis 3, Minn.

## Saw Protractor

A new and practical saw protractor for use as a guide in power sawing introduced by The Black & Decker Mfg. Co. is claimed to enable the operator to cut practically any angle accurately and easily. The saw protractor is sturdily constructed of metal for rigidity, yet it is very light, weighing only 1½ lb. It consists of a straight edge, a segment clearly calibrated in units of 1°, and an easily movable holding arm.

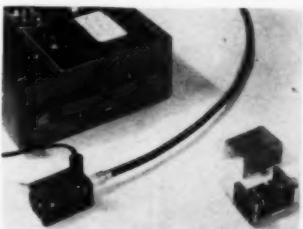


Saw Protractor

The desired angle is set quickly by merely loosening a wing nut on the under side of the holding arm and moving the arm until the indicator points to the correct degree mark. The wing nut is then retightened to prevent slippage of the holding arm. The Black & Decker Mfg. Co., Towson 4, Md.

## R.F. Wattmeter

Motorola Inc. is producing two small resistive load R.F. wattmeters for use with the Motorola P-8501 and P-8501-A test sets or any 0-50 microammeter. The Model P-7280 measures R.F. power output

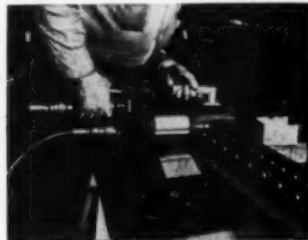


At left the Motorola R.F. wattmeter is shown ready for a test. At right the same unit is shown with cover off so that the load resistors can be seen.

from 0-60 watts and is used for testing base stations and mobile unit transmitters. The model P-7208-A measures transmitter power output from 0-2 watts and is recommended for portable unit testing, such as the "Handie-Talkie" portable radiophone. The output of the transmitter being tested is fed into the wattmeter load, and the suitable indicating device is connected to the jack provided. The calibration chart supplied is used to correlate the power dissipated in the load unit and the meter readings. A hermetically sealed crystal diode and a 1% metalized multiplier resistor are incorporated in the unit. Motorola Inc., 4545 Augusta Blvd., Chicago 51, Ill.

## Riveter Utilizes Hydraulic Pressure

A new unit for driving rivets with hydraulic pressure has been developed by Manco Mfg. Co. The riveteer utilizes a "squeezing" action rather than the customary hammering of the rivet head. The unit delivers 60,000 lb. thrust through the hydraulic ram and will drive ¾ in. cold



Guillotine Riveter

rivets. The unit is portable, easy to operate and according to the manufacturer, the entire riveting cycle takes but 2½ seconds. The operator merely presses the hand valve to actuate the ram. Release of the valve provides automatic retraction. Among the advantages the manufacturer states that by the use of hydraulic pressure, full thrust is delivered over the entire stroke and no adjustment is needed between different length rivets. Manco Mfg. Co., Bradley, Ill.

## Single-Phase Capacitor Motors

General Electric's Tri-Clad line of single-phase capacitor motors has been extended to include a totally enclosed fan-cooled construction. Features of the new design include starting capacitors and switch mounted within the frame to provide maximum protection with minimum space requirements. Available in ratings of 1, 1½, 2, 3, and 5 H.P., the new line was developed for use where extra severe conditions of dirt, grit, or moisture are encountered. It is also offered in explosion proof and dust-explosion proof construction for installation in hazardous locations. General Electric Co., Schenectady, N.Y.

# THE SEAMAN DOES MORE THAN MIX— IT **BLENDS** THE COARSE AND FINES!

A road mix may be excellent from the standpoint of coverage or distribution of binder but more than that is essential to obtain the highest possible load bearing value.

The coarse aggregate must be proportioned and distributed uniformly throughout the base.

The fines must fill the voids throughout as a uniform blend, for if segregation of fines and coarse occurs the base will ravel under traffic and become greatly weakened.

This accurate balanced-blending is accomplished automatically by the SEAMAN MIXER. That is why SEAMAN-mixed base courses are superior — whether of bituminous construction, soil-cement, or of any of the many excellent stabilization methods in use today.

That is also the reason why macadam construction, long greatly curtailed because of the high cost of hand labor formerly needed, is becoming widely popular again. The SEAMAN automatically produces the highest type of macadam base at 1/10 to 1/5 the cost of hand brooming. This has been proved by actual road construction.

In road-mixing of any type the SEAMAN completes the work at a highly profitable saving in time — and does a vastly superior job because it blends as it mixes.

So, do all your mixing with the SEAMAN.



Typical cross section of a SEAMAN-mixed base before compaction showing the uniform proportioning and blending of coarse and fines from bottom to surface of the mix. Notice the light blanket of fines at the surface which the SEAMAN automatically produces.

SEAMAN PULVI-MIXER ON AIRPORT CONSTRUCTION — Mixing aggregate macadam. Note even blend of coarse and fine aggregates behind SEAMAN.



A post card will bring you this **FREE BOOK "SOIL STABILIZATION METHODS"**

100 pages of up-to-the-minute information about all types of bituminous, soil-cement and other stabilization processes. Send for it now.

## SEAMAN MOTORS, INC.

291 N. 25TH ST.

MILWAUKEE 3, WIS.

"Train" of 2 SEAMANS working in soil cement processing 20 feet wide.



### Service Cover for Equipment

A new plastic waterproof service cover for the protection of machines against the harmful effects of grease, water and dust is offered by South Bend Machine Works. These maroon covers have machine stitched bound edges to insure sturdiness and long life. These plastic covers come in six sizes: 12 x 28 x 28 in.; 21 x 37 x 24 in.; 32 x 48 x 17 in.; 32 x 60 x 17 in.; 38 x 72 x 25 in. and 38 x 96 x 25 in. South Bend Lathe Works, 425 East Madison St., South Bend 22, Ind.

### Fork Lift Truck

A new 2000 lb. pneumatic tire fork lift truck has been added to the line of the Buda Co. Rated at 24 in. and 15 in. load centers, the new fork trucks have many features for fast handling, operating economy and low maintenance. Features of the new models include: carriage mounted

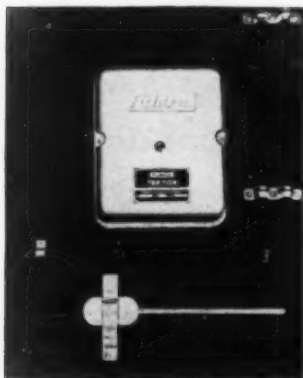


New Buda Fork Lift Truck

on patented adjustable side thrust rollers to eliminate wear; extra strength and self-aligning mast; single lever two speed forward and two speed reverse gear shift, complete compliment of gauges and switches on full front vision instrument panel; and quick change heavy duty clutch. The Buda Co., Harvey, Ill.

### Level Control Switch

A new switch, announced by Fielden Instrument Corporation, makes possible level control of practically all liquids and solids. Liquids may be of high or low viscosity and may have electrical conducting



Tektor Level Switch

or insulating properties. No electrical contact is necessary with the material under control. The equipment does not rely on floats, diaphragms, or any moving mechanical parts. The electrode, connected to the instrument through a 2-ft. length of cable, consists of a simple probe, 4 in. to 6 in. long, 1/4 in. to 3/8 in. in diameter, which is inserted into the container at the level at which control is required. A level differential of 1/32 in. up to 3/8 in. may be obtained. The probe may be insulated or not, depending on the application. For some applications the sensing element may be flush with the inner surface of the container. Fielden Instrument Corporation, 2920 North Fourth St., Philadelphia 23, Pa.

### Circular Saw Filing Tool

A new tool, known as "Sharp-Set," for setting and filing the teeth of circular saw blades, announced by Clark & Sawyer, Inc., is adjustable for blade diameters from 6 in. to 18 in. and accommodates all standard size and shape arbors. The tool can be carried in the tool box with other tools and is used right on the job. At one

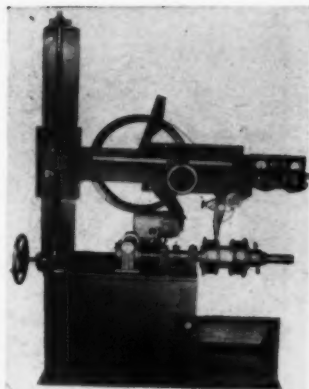


Saw Setting and Filing Tool

end of the "Sharp-Set" there is a tool steel "hammer and anvil" matched at 15 degrees to give the saw blade the proper set. The other end has a tension bar for filing the teeth under proper tension. A built-in clamping device for convenient fastening in a vertical position is available when the tool is used for saw filing. Clark & Sawyer, Inc., 600 Mateo St., Los Angeles 21, Calif.

### Welding Equipment

A new line of automatic welding and positioning equipment designed for the rebuilding of worn equipment parts such as tractor idlers and rollers, shovel rollers and shafts, crusher cones, etc., has been announced by Mir-O-Col Alloy Co. The equipment utilizes the submerged arc principle of automatic welding, and an alternating current transformer type welding

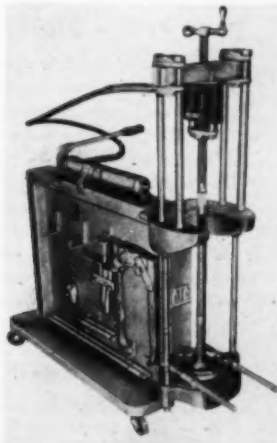


Mir-O-Col Model K-1 Automatic Rebuilder

machine in conjunction with a work positioner capable of handling conical or cylindrical equipment parts which weigh up to 750 lb. and whose diameter is not less than 4 in. or greater than 36 in. All work is held on centers, which assures a concentric buildup of the worn part. Mir-O-Col Alloy Co., 310 North Ave. 21, Los Angeles, Calif.

### Pulling Tools Carrier

A new portable Hydra-Tote announced by Owatonna Tool Co., 435 Cedar St., Owatonna, Minn., takes pulling tools to the job in place of hauling the job to the tools. The Hydra-Tote holds the complete OTC hydraulic pulling system. The Hydra-Tote is of sturdy, welded steel construction, 32 in. high, 36 1/2 in. long, 16 in. wide at the base and 4 in. wide at the top.



OTC Hydra-Tote

There is 10 1/2 in. of clearance between the press uprights, 11 in. clearance from the ram to the top of the press plate and 34 in. from top of press plate to the floor. Almost unlimited vertical adjustment is possible with interchangeable legs in the upper press frame and three easy adjustments in the lower press frame. It is equipped with 3 in. rubber casters for easy mobility.

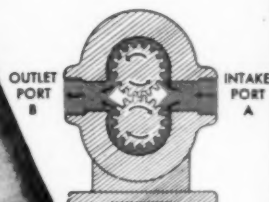


... as simple and maintenance-free  
as a Waterwheel!

# LULL Fluid-Driven SUPER SWEEPER



**Here's How  
LULL FLUID DRIVE  
Works!**



**MODERN LULL FLUID DRIVE provides**

**High Speed Sweeping All Year 'Round!**

Application of LULL Fluid Drive marks an important milestone in modern sweeper engineering. No universal joints! No complicated gear and shaft mechanism for driving broom! LULL Fluid Drive provides flexibility and high efficiency under all operating conditions because it is simple and thoroughly dependable.

In addition, LULL Finger-tip Power Hydraulic Controls regulate broom height, angle settings, and broom rotation speed. Operator never leaves his seat. No time lost deadheading, backing, or making manual adjustments!

On any sweeping job . . . streets, blacktop highways, air ports, parking lots, strip mines . . . you can't beat the all year round performance of a LULL Fluid-Driven Super Sweeper. 5', 6', and 7' models are all priced within your means.

**Powerful LULL Precision  
Hydraulic Pump** forces

fluid through flexible hose into intake port "A". Then fluid drives vanes around motor cavity until it reaches outlet port "B". Now fluid is returned to pump for recirculation. Smooth power is provided for the broom without complicated drive mechanism.

**LULL FLUID DRIVE** is simplicity itself. This means fewer moving parts . . . longer maintenance-free service. Lull Super Sweepers do more sweeping in less time and at lower cost!

**WRITE TODAY for new LULL Sweeper Bulletin AD40**

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**Manufacturing Company**

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**Designers and Builders of  
The Largest Line of Allied Equipment  
for Industrial Wheel Type Tractors**



**SHOVELoader**



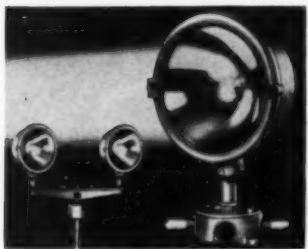
**UNIVERSAL Loader**

**SHOVELoaders • UNIVERSAL Loaders • FLUID-DRIVEN Sweepers • LULLDOZERS • SHOULDER MAINTAINERS**



## High Intensity Spotlight

A powerful, new outdoor spotlight providing 100,000 candlepower with only a 300-watt rating announced by Stonco Electric Products Co. is designed to concentrate its entire light output in a long-throw, oval-shaped, narrow floodlighting beam. Made of non-corrosive, heavy-duty cast aluminum throughout, the Stonco No. 56 spotlight has a universally adjust-



Stonco No. 56 Spotlight

able cast-aluminum swivel arm threaded  $\frac{1}{2}$  in. NPT to fit a variety of standard interchangeable accessories such as flat base, weatherproof junction boxes, wall brackets, wiring troughs, etc. Up to five units can be mounted to a single cluster light assembly. Stonco Electric Products Co., 489 Henry St., Elizabeth 4, N.J.

## Portable Traffic Signal

A new portable traffic signal, known as the "Mechanical-Cop," produced by Henderize, Inc., is a self-contained unit, 8 ft. high and weighing 290 lb. It operates either on 110 volts, or on a battery housed in the base, which provides enough power for 30 hours of continuous operation, without charging. The machine also has its own built-in charger. The timer is the heart of the machine. When a three-way control switch is thrown to the "left" position, the lights flash from green, to



"Mechanical Cop" Traffic Signal

amber to red, in accordance with the National Code. When the switch is in "center" position, all lights are off. When the switch is thrown to the "right" position, the lights flash amber in one direction and red in intersecting directions. Henderize, Inc., 5667 Freeport Blvd., Sacramento, Calif.

## Electronic Scale

A new Ametron electronic scale has been announced by Streeter-Amet Co. By use of electronic cells this new scale will record and print on ticket, tape or even a ledger remote from the scale, the exact weight. The president or superintendent can read the weight in his office the same instant the products are being weighed in the shipping department. The weigh master sitting at his station can read the weight of the shipment being made in the yards down the track. Streeter-Amet Co., 4101 Ravenswood Ave., Chicago 13, Ill.

## 2-Way Mobile Radio

Accessibility of 15-in. Motorola F.M. 2-way mobile radio housings has been increased greatly by the addition of a new "split-housing" feature now being introduced by the company. New 30 and 60-watt mobile sets are now being shipped with the new design that makes mounting possible in positions where the drawer-



Breakdown of Motorola's New 15 in. "Split" Housing Showing Accessibility

type housing could not be installed because chassis withdrawal would have been impossible. Because of the split-housing feature the chassis can be lifted out of the lower section of the housing. As a result of this new feature, Motorola mobile units can be mounted in previously inaccessible positions, particularly in the lowered type of trunk design of some new automobiles. Motorola, Inc., 4545 W. Augusta Blvd., Chicago 51, Ill.

## Air Grinder

A new air grinder, announced by Ingersoll-Rand, has an added safety device to prevent overspeed operation and possible accident. The new grinder contains a motor governor to maintain correct wheel speed, plus a built-in unit called the "overspeed safety coupling." In case the motor overspeeds because of governor wear, abuse, maladjustment or dirty air, the "overspeed safety coupling" automatically



Air Grinder

uncouples the arbor and the grinding wheel from the motor, making it impossible to operate the grinder until the cause of overspeeding has been corrected. Another safety feature of the grinder is a multiple exhaust system. The grinder is available for 8 in., 6 in., or 5 in. wheels, running at respective motor speeds of 3100, 4100 and 4500 r.p.m. Overall length is 24 $\frac{1}{2}$  in. with straight handle and 22 $\frac{1}{2}$  in. with grip handle. The grinder has a maximum side to center distance of 2-5/16 in. and weighs approximately 16 $\frac{1}{2}$  lbs. with guard. Ingersoll-Rand Co., 11 Broadway, New York 4, N.Y.

## Hydraulic Dragshovel

The Hydrohoe, a completely hydraulic truck mounted dragshovel, announced by Bucyrus-Erie Co. has special exclusive features, according to the manufacturer, which make trenching and other specialized digging faster and easier. These include two separate digging actions; precision control permitting fraction-of-inch movements; hydraulic ejector on dipper; no bails, sheave blocks or drag ropes on the bucket to interfere with loading; and rapid conversion to clamshell or crane in the field. Force for the machine's pri-



New Bucyrus-Erie Hydrohoe

mary digging action is applied by a hydraulic ram located between the boom and the dipper handle. A second, separate and distinct digging motion comes from the telescoping of the boom. By hydraulically extending and retracting the boom, the operator reportedly makes a level, scalloped-free cut, digs across pipe and buried cable, excavates in front of and behind boulders to roll them free—all without moving the machine an inch! The Hydrohoe is reported to work effectively to a 12-ft. 6-in. depth over rear of truck, and have a maximum reach of 23 ft. It is operated by the regular truck engine, furnishing power to hydraulic pumps through a power take-off. Bucyrus-Erie Co., South Milwaukee, Wis.

## Single Pass Gravel Plant

A single pass gravel plant announced by Diamond Iron Works, Inc., is designed for use wherever aggregate specifications are of limited restrictions. Available in three plant sizes, the single circuit plant is expressly designed for use by counties and townships for the processing of gravel for construction of secondary roads, and for use when processing gravel on small jobs requiring frequent moving where mobility counts. Capacities, based on 25% oversize passing a 1-in. screen, are stated to be approximately 20-24 tons/hr. for the No. 116 plant, 48-60 tons/hr. for the No. 120, and 50-65 tons/hr. for the No. 124 plant. Outstanding features of the new plants include a steel "I"-beam gooseneck frame, 6 ft. x 8 ft. grizzlies with 9 in. x 10 in. openings, 16 in. x 5 ft. reciprocal plate feeders, sloping vibrating screens (No. 116 and No. 120—2 ft. x 6 ft.; No. 124—3 ft. x 6 ft.) using gravity to screen

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long-life construction.

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4D-100 Heavy Duty 100 H.P.

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An informative series of color slides showing WARCO design construction... operation... now at your WARCO dealer's. Ask for a showing soon!



Diamond Single Pass Gravel Plant

faster, 2-yd. folding feeder hoppers for greater portability, "V"-belt drive, clutch-controlled material flow, and an operator's platform permitting full view of the entire plant. An 18 in. wide sand rejector conveyor is optional equipment. Diamond Iron Works, Inc., 18th Ave. No. and 2nd St., Minneapolis 11, Minn.

### Bulldozer

The Caterpillar No. 10S bulldozer, a straight blade machine for use with the company's line of DW10 tractors, is now being manufactured by Caterpillar Tractor Co. Similar in design to other Caterpillar bulldozers, the components of the No. 10S bulldozer include the blade, push arms and braces, hitch, sheave support and heavy-duty radiator guard, combination cable and sheave group. The trunnions for the new bulldozer model are included in the weight box and frame group



Caterpillar No. 10S Bulldozer

which differs widely from the company's track-type tractors. This group is a substantial assembly, fabricated of heavy structural steel plate mounted in conjunction with the Caterpillar DW10 Tractor frame. The heavy-duty weight box and frame group not only provides support for the bulldozer trunnions at each side of the tractor, but includes a heavy box at the rear of the tractor to accommodate four counterweights. Caterpillar Tractor Co., Peoria 8, Ill.

### Diesel Engines

Several improvements designed to prolong engine life and further reduce upkeep of General Motors Series 71 Diesels have been announced by Detroit Diesel Engine Division. Chief among these newly designed features is a method of oil, water and compression sealing between the engine block and head which does away with the laminated gasket. Detroit Diesel has adopted individual seals designed to place primary emphasis upon compression sealing and secondary but sufficient emphasis on sealing the oil and water passages. Because no over-all or one-piece gasket is used, the new system is called the "metal-to-metal" head and block. Compression gaskets, in the form of laminated Terne Plate rings, take the major pressure of the head-to-block stud bolts. A small "skirt" on each compression gasket ring fits into a recess between the cylinder liner and the cylinder bore in the block, assuring correct positioning over the cylinder liner. Water and oil passages between head and block are sealed with individual synthetic rubber seals. A second new feature in the Series 71 engine design is a special chilled-and-tempered cast-iron ring which now forms a replaceable seal for the cylinder liner upper flange. Other



Above: Center Avenue looking north from the corner of City Park.

Right: View of Second Street looking west from downtown section.



In Curtis, Nebraska  
low annual cost leads  
to 7 to 1 popularity of  
**CONCRETE  
STREETS**

CITIZENS OF Curtis, Neb., have the unique distinction of owning perhaps more square yards of concrete pavement per capita than any other city in America—about 89 sq.yd. of concrete pavement for every man, woman and child in the city. There's a reason for this tremendous popularity of concrete.

Back in 1931, Curtis placed its first concrete paving—10 blocks, or 21,634 sq.yd. Those streets served so satisfactorily that in 1937, 18 more blocks, or 23,470 sq.yd., were paved with concrete.

Until 1948 not a cent was spent for maintaining those concrete streets. During 1948 and 1949 the total amount spent on maintenance resulted in a cost of only \$.0016 per sq.yd. per yr. for the 18-yr. period.

When the citizens of Curtis were asked to express a preference, in 1949, for concrete or another type of pavement for the next project covering 30 blocks, they voted about 7 to 1 in favor of concrete, despite its higher initial cost. Years of experience had proved that it wasn't the first cost but the *annual cost* that counted. Today more than 75 per cent of the city's streets are paved with concrete.

The record of superior performance which made concrete the preferred pavement in Curtis is a familiar story in hundreds of cities from coast to coast. Concrete usually costs less to build than other pavements of equal load-carrying capacity. It costs far less to maintain and it renders longer years of uninterrupted service. These three factors result in **low annual cost**. That is the final accounting which pleases motorists and taxpayers alike.

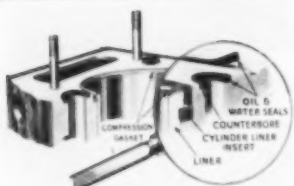
For more information about how to design and build durable, **low-annual-cost** pavements write for your copy of a free booklet, "Concrete Pavement Design." Distributed only in the U. S. and Canada.

## PORTLAND CEMENT ASSOCIATION

DEPT. A9-28, 33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

When writing advertisers please mention **ROADS AND STREETS**, September, 1951



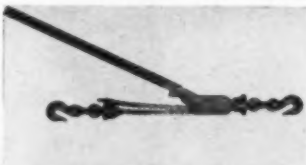
Cutaway Illustration of New Head to Block Sealing

new design features include roll-burnished crankshaft fillets and peened oil holes in the Tocco-hardened crankshaft. Re-design of the block also enabled Detroit Diesel engineers to improve the retention of intermediate camshaft bearings by installing

longer retaining screws. Detroit Diesel Engine Division, 13400 West Outer Drive, Detroit 28, Mich.

#### Load Binder Works on Ratchet Principle

A new load binder announced by Coffing Hoist Co. works on the ratchet hoist prin-



New Coffing Hoist Binder

ciple, and will take up or slack off a load chain any amount up to a full 20 1/2 inches—or more if a longer chain is used in the binder. According to the manufacturer, this advantage over eccentric type binders is especially important with "springy" loads where the binding chain or cable must be tightened by force through considerable distance in order to fully secure the load. Also, if a load settles in transit, the new Coffing unit is easily tightened any amount without the necessity of releasing the entire load to take a new "grab." The binder weighs 10 lb. and will exert a pull of 3,000 lb. Coffing Hoist Co., 800 Water St., Danville, Ill.

#### Binoculars

A newly developed process by Swarovski Optik of Austria, double blue foil on all surfaces of the lens in their Habicht binoculars, is claimed to guarantee an unlimited constancy. This special process is stated to increase the brightness of the image, particularly in the dawn and sunset



Habicht Binocular

and practically eliminates internal reflections. Two series of models with central focusing are available. The field of view of the 6 x 30 series is 490 ft. at a distance of 1,000 yd. The 7 x 42 series has a field of view of 354 ft. at 1,000 yd. The weight of 6 x 30 is 14 oz., 7 x 42 is 24 oz. Distributed in the United States exclusively by L. D. Borgen Co., 8 Bridge St., New York 4, N.Y.

#### Tamper-Roller

A new roller, tamper or compactor for patching and repairing black top, rolls and tamps flush with curb and walls. Tamperers can be operated by moving one lever. Machine is friction driven, one control lever forward and reverse. No shifting gears. Rolls and tamps 18 in. width. The ma-



Lucas Compactor

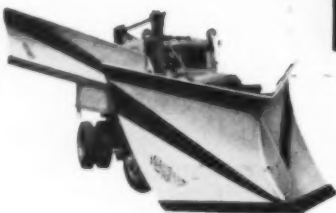
chine weighs 325 lb. It has two 7 1/2 in. divided rolls and two 4 in. by 9 in. steel shell tamperers. Tamperers weigh 9 lb. each and have a 2 in. stroke hitting 100 lb. blows per square inch at 350 strokes per minute. Tamperers overlap leaving no ridges. Lucas Compactor, 2209 E. Market St., Stockton, Calif.

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QUARTER OF  
A CENTURY!

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**SNOW PLOWS**

A SIZE & STYLE FOR  
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HIGH SPEED ONE-WAY  
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TAILORED to truck to distribute weight and stress.  
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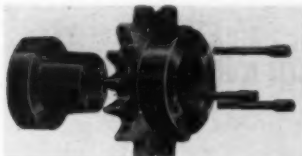
PIONEER SNOW PLOW BUILDERS  
WAUSAU, WISCONSIN

Sold and Serviced By Leading Equipment Distributors



### Interchangeable Hub Sprocket

The Fort Worth Steel & Machinery Co. has developed a sprocket to fit their "QD" V-belt sheave hub so that their distributors can give immediate "off the shelf" service without re boring on sprockets as well as V-sheaves. The "QD" sprocket is taper-bored to receive the tapered hub.

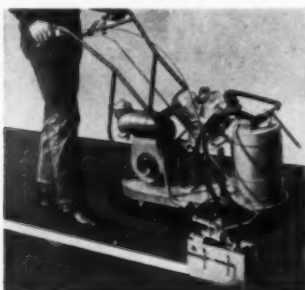


"QD" Sprocket

Bolts are provided to pull the sprocket onto the tapered split hub for a tapered drive assembly and a positive press fit on the shaft. Tapped holes in the sprocket permit the use of pull-up bolts as jack screws to break the tapered fit when dismounting the sprocket. Set screw over the keyway holds key in position. Fort Worth Steel & Machinery Co., Fort Worth, Tex.

### Line Marker

A line marker now in production by Universal Manufacturing and Sales Co. has specially developed paint guides to ride over rough surfaces and provide sharp, clean lines. The marker is stated to put down 10,000 ft. of line per hour. The machine is powered by a 1/2 H.P. 4-cycle air cooled engine. The compressor

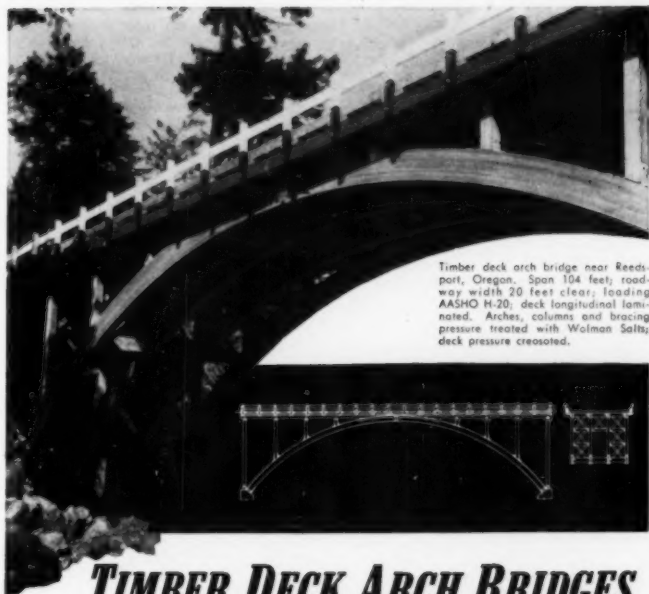


Mark-Rite "Econo-Liner"

unit is diaphragm type, twin cylinder, providing 4 cu. ft. of air per minute. The paint container is 5 gal. capacity and can be readily removed for cleaning. It is equipped with quick release handle permitting rapid reloading. The machine can be quickly and easily converted to a light duty portable spray rig. Universal Manufacturing and Sales Co., 8716 Santa Fe Ave., South Gate, Calif.

### Front End Loader

A new addition to its Shovel loader line, announced by Lull Manufacturing Co., is the Model 3-B, built exclusively for the Case VAI industrial tractor. Noteworthy among the outstanding features of the new 3-B is its design which permits the installation of the Case VAI-5 mower attachment without interfering with the operation of the Shovel loader or the mower. Both Shovel loader and mower operate independently of each other and neither



Timber deck arch bridge near Reedport, Oregon. Span 104 feet; roadway width 20 feet clear; loading AASHO H-20; deck longitudinal laminated. Arches, columns and bracing pressure treated with Wolman Salts; deck pressure creosoted.

## TIMBER DECK ARCH BRIDGES

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**T**remendous load carrying ability, lasting soundness and ready availability of glued laminated arches make them ideal structural members for economical, permanent bridges. Formed of kiln dried lumber and bonded with waterproof glues as permanent and strong as the wood itself, these arches are free from seasoning action. They require no maintenance through the years.

Deck arch bridges are most practical over canyons with walls to contain the horizontal thrust. Pier height is held to a minimum, yet the bridge deck is raised well above the water level. With no overhead members of any kind, road clearance is unlimited. Roadway may be of any accepted material.

### Approved Preservative Treatments Available

With proper preservative treatment the timber bridge will give a lifetime of trouble-free service, lasting far beyond the time when changing traffic demands necessitate highway relocations and a new site. Any of the approved treatments is available for Timber Structures bridges.

The deck arch bridge is only one of several types fabricated by Timber Structures, Inc. Details of the various types are contained in folder, "Permanent Timber Bridges". A copy of this folder is ready for you at your nearest Timber Structures office. Or send us the filled-in coupon, and your copy will reach you promptly.

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Model 3-B Shovel loader With Mower Attachment

must be removed from the tractor while operating the other. The bucket is controlled by a parallelogram mechanism which automatically keeps the bucket level while raising, thereby eliminating spillage of load. This design also is stated to provide "split-second" dumping, tremendous digging power and controlled "scooping action." The bucket can also be controlled independently when desired. As all Shovel loaders, the 3-B is equipped with the Lull precision-built hydraulic pump and Lifetime pistons and rings in all hydraulic cylinders. Alternate, quickly-interchangeable loader attachments available for the unit are the  $\frac{3}{4}$  yd. material bucket,  $\frac{1}{2}$  yd. loose material bucket,  $\frac{1}{4}$ -1 yd. coal or snow bucket, bulldozer, lifting crane, fork lift and motor driven sweepers. —Lull Manufacturing Co., 3612 East 44th St., Minneapolis 6, Minn.

#### Protective Sleeves

New telescopic accordion sleeves, placed on the market by A & A Mfg. Co., were developed particularly for protecting moving parts, shafts, etc. They are claimed to be impervious to oils, greases, gases and water, and to withstand temperatures of —60 degrees F to plus 180 degrees F. The

sleeves are being manufactured in any diameter or length from 1 in. ID (inside diameter) and 2 in. OD (outside diameter) to 12 in. ID and 24 in. OD for lengths from 2 in. to 30 ft. In addition to widening the scope of use by machinery and equipment manufacturers and designers, the sleeves are being widely used throughout industry by maintenance departments to keep machines working full time. This is especially true where oil soaking and cracking has been a problem



Telescopic Accordion Sleeve Is Made of Gortite

and for complete protection against sand, grit, coal dust and other foreign materials. A & A Mfg. Co., 2017 West Clybourn, Milwaukee, Wis.

#### Crane Truck-Snow Fighter

The illustration shows a Walter unit delivered recently to Logan Airport, Boston, Mass., for general wrecking and crane service and snow clearing. This combination offers a 10-ton power boom crane with an 18 ft. telescopic boom, extendable to 25 ft., mounted on a Walter four point positive drive chassis, 240 H.P., with large single tires, 16:00-24, resulting in maximum ability to roll over soft and difficult ground conditions, such as mud and sand, and the ability to carry heavy loads over difficult terrain. The unit is equipped with a separate boring winch, 40,000 lb. capacity, with 500 ft. of  $\frac{3}{4}$  in. diameter cable



Walter Snow Fighter Crane Truck

so that objects may be pulled up to the unit, raised, and carried as may be required. For winter snow clearing operations, the unit is provided with a front snow plow and side wing for fast clearing of large snow areas. Walter Motor Truck Co., 1001 Irving Ave., Ridgewood, Queens, Long Island, N.Y.

#### Gravel Plants

Two new portable duplex plants, announced by Pioneer Engineering Works, employ the exclusive Pioneer principle of bottom deck feed, and are designed to offer greater screening area and to permit balanced crusher loads through adjustment of the jaw crusher setting. The two plants are identical except for the size of the jaw crusher. The 25V has a 10 x 36 jaw. The 24V has a size 10 x 24. Both models are equipped with a 24 in. x 16 in. double roll crusher. The 3 ft. x 10 ft.,  $3\frac{1}{2}$  deck, vibrating screen provides 60 sq. ft. of effective sized material screening area. Both plants are fed with swivel type field conveyor equipped with a 24 in. mechanical (reciprocating plate) feeder. Delivery of sized material is handled by a 24 in. x 25 ft. channel frame conveyor. Travel height of both plants is 12 ft. 6 in. Overall length (less feeder conveyor) is 40 ft. Both plants have a 21 ft. wheelbase. Travel weight of the 25V, without power

## The BEST... for more than One reason

ADJUSTABLE  
BRUSH TENSION  
SWEEPS IN  
EITHER DIRECTION  
LIGHTWEIGHT  
MONO-FRAME  
CONSTRUCTION



## LITTLEFORD ROAD BROOMS

When you're putting your money on the line for new Road Equipment, naturally you want Value received. Where can you get more for your dollar than investing it in a Littleford Road Broom? Here is the only Road Broom with Patented Hydraulic raising and lowering system; this arrangement saves dollar upon dollar in brush replacements. The tension on the brush can easily and simply be adjusted to the road surface which reduces brush wear. This is only one of the many features found on either the Engine Driven Broom, or the Traction Driven Broom. Remember the LB sign means Littleford Bros. and Lower Budgets for the best Road Equipment.



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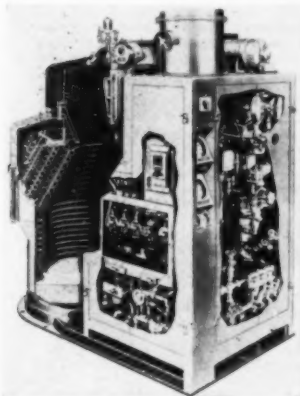


**New Pioneer Portable Duplex Plant**

unit, is approximately 46,000 lb.; of the 24V, approximately 42,100 lb. The 24V and 25V are designed especially for use in areas of restricted highway load limits where, in spite of such weight limitations, reasonably high production of aggregates is required. Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

### Steam Generator

The Vapor Heating Corporation has announced that its Vapor-Clarkson steam generator Model 4740 developed to supply large quantities of hi-pressure dry steam, to heat diesel powered passenger trains, now a standard installation in diesel locomotives, is now ready for industry to supply processing steam, operate pile driving rigs, laundries, heating, and 600 lb. pressure steam, etc. Other uses of the steam



**Vapor-Clarkson Steam Generator**

generator in the construction field are for hoists, asphalt plants, concrete ready-mix plants, and concrete block plants. The generator develops 200 lb. steam pressure in two minutes from 50 degree cold water and produces 4800 lb. of 99% dry steam per hour, 82% efficient. Uses No. 2 fuel oil for fuel. The overall size of this package unit is 52 in. wide, 76 in. long and 78 in. high. Vapor Heating Corporation, 4501 W. 10th St., Chicago, Ill.

### New Road Material

A new road material, announced by Koppers, may be applied in any kind of weather, can be stock-piled in readily usable form throughout the winter and laid down without heating, using standard road-repair equipment. This new product, called Komac, is a blending of bituminous materials with aggregate through a special homogenizing process. It has been announced the Komac will be produced in limited quantities this fall in Koppers plants at Chicago, Ill., and Utica, N.Y., with additional facilities possible in time for the 1952-53 winter season. For the



## "TICKLISH JOB"

**for hoe and crane operators**

Close quarters, low hanging trees, pipes criss-crossing trench path . . . that made trenching a ticklish job for the hoe operator. And the crane operator's job was just as critical. Working in cramped space where boom couldn't be raised above cab top required exceptional control to place gas main sections under the small cross pipes.

But the job was done . . . and done profitably and easily with a MICHIGAN crawler and a MICHIGAN truck crane by William W Adams, Inc., general contractors of Tenafly, New Jersey. That's why George Adams says . . .

*"I like MICHIGAN . . . I wouldn't have bought three of them otherwise. They are very easy on maintenance and easy on the operators."*

Comments like these are typical from profit-wise contractors everywhere. Next time you need an excavator crane . . . investigate MICHIGAN and you'll agree it's your best buy! Write, wire or phone for full details.

# MICHIGAN POWER SHOVEL COMPANY

480 Second Street, Benton Harbor, Michigan, U. S. A.

time being, Koppers will particularly recommend the new material for road patching. The material has been under test for two years, and contractors who assisted in making the tests have noted the following advantages of the material: It is mixed cold in any type of mixing equipment. It can be stock-piled during the summer and fall at strategic places and removed easily from the stock-pile in any kind of weather including coldest winter days. It does not adhere to hauling or spreading equipment. In repair work, no primer is needed. The material need only be tamped or rolled into the holes in the pavement. It can carry traffic immediately after it is rolled. The material does not "bleed" in hot weather. Koppers Co., Inc., Pittsburgh 19, Pa.

## MANUFACTURERS' LITERATURE

### Roadgrader Gauges

A 4-page circular of Roadgrader Gauge Corp illustrates and describes how their gauges are used in fingrading operations. The gauges can be attached to any motor grader to make a complete fine grading unit that can fine grade accurately to any desired depth. Roadgrader Gauge Corporation, Equitable Bldg., Wilmington, Del.

### Waterproofing Masonry

A new product information and application bulletin on H2-O-NO, silicone base liquid water repellant for masonry, announced by The Chem Industrial Co., contains complete instructions for using this new material, technical data, coverage facts, etc. The Chem Industrial Co., 1114 Hippodrome Bldg., Cleveland 14, O.

### Carbide Tipped Hammer Bits

A new 2-color folder, published by the New England Carbide Tool Co., Inc., shows and tells how effectively Thunderbolt bits perform when drilling holes, under a variety of conditions, in hard concrete or granite. Standard lengths and extra long lengths' specifications and prices are included. Chuck wrench specifications and prices also are given. New England Carbide Tool Co., Inc., 60 Brookline St., Cambridge 39, Mass.

### Vertical Turbine-Type Pumps

An 8-page catalog describes the Ingersoll-Rand Class APH-APK line of vertical turbine type pumps. Available in single- or multi-stage construction, with any desired column length, these pumps range in size from 6 to 30 in. for capacities to 15,000 gpm and pressures to 250 psi. Either open, water-lubricated shaft or oil-lubricated, enclosed shaft constructions are available. Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

### Crawler Tractors On Soil Conservation

The varied applications contractors are finding for International crawler tractors

in the nation's soil conservation and land reclamation program are pictured in an 8-page folder issued by the International Harvester Co. Entitled "International Power Makes Soil Saving a Pay Dirt Proposition," the folder outlines the dirt moving possibilities in the Soil Conservation Service's 20-year program to save 10,000,000 productive acres from erosion and presents conservation jobs currently in progress. International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

### Heavy Duty Motor Trucks

A new, fully illustrated bulletin, showing the Federal line of heavy duty motor trucks, has been released. The bulletin illustrates many types of heavy-duty vehicles available, including six-wheelers. It also has sections covering Federal gasoline and diesel engines, special heavy-duty construction features and specifications on the complete line. Sales Division, Federal Motor Truck Co., Detroit 9, Mich.

### Scout-Crete

Applications and specifications for Getman's new Scout-Crete are covered in a recent circular. This material handler has an overall length of 90 in., an overall width of 43 in. and a recommended load carrying capacity of 2,500 lb. It is powered by a Wisconsin air-cooled engine with double V-belt drive to 4-speed truck transmission. Getman Brothers, Manufacturing Division, Benton Harbor, Mich.

### Hydraulic Pumps and Motors

The new "D" series of "Commercial" oil hydraulic pumps and motors is presented in a 60-page catalog of The Commercial



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Shearing & Stamping Co. Complete performance data are given for both pumps and motors. Six standard types of mountings are available; eight styles of shafts, all interchangeable, are completely detailed. Complete porting arrangements are clearly detailed for both side and end ports or combinations of both. Mounting data and dimensions are given for every size of each model. The Commercial Shearing & Stamping Co., Youngstown 1, O.

### Trough Conveyors

Two models of Farquhar trough conveyors for handling crushed stone, sand, gravel, fine coal, etc., are illustrated and described in a new 8-page catalog. Various features are pictured and a dimension table is included. These conveyors have low feed ends which make them most efficient for unloading hopper bottom cars, in combination with Farquhar under car unloaders. When the conveyor must be fed by hand, the low feed end permits scraping the material to the carrying belt, instead of lifting it by shovels to a feed hopper. A. B. Farquhar Co., Conveyor Division, York, Pa.

### Elevator; Hoisting Tower

Wilson-Albrecht Co., Inc., has issued revised specification and illustration sheets on the Waco portable elevator and Waco material hoisting tower, incorporating improvements and additional features of the equipment. Wilson-Albrecht Co., Inc., 3565 Wooddale Ave., Minneapolis 16, Minn.

### Revolver Cranes

A new catalog featuring American revolver cranes in industrial use released by American Hoist & Derrick Co. contains views of the cranes working at ports and industrial plants throughout the world. It shows many specialized applications. Contents include short job stories as well as rated lifting capacities of the five standard models. American Hoist & Derrick Co., 63 South Robert St., St. Paul 1, Minn.

### Aerial Surveys

Reprints of three papers on aerial surveying presented at the recent Michigan Highway Conference are available from Abrams Aerial Survey Corporation. The papers are: "Aerial Surveys Applied to Highway Engineering by the Michigan State Highway Department," by John E. Meyer, photographic engineer of the department; "Air Photos as Used by the Genesee County Road Department," by F. E. Appleton, office engineer, Genesee County (Michigan), and "Air Photos in Airport Planning," by L. C. Andrews, chief engineer, Michigan State Department of Aeronautics. Abrams Aerial Survey Corporation, 606 E. Shiawassee St., Lansing 1, Mich.

### Automatic Radiator Shutters

Literature is available on the Kysor automatic operated shutters for trucks, busses and stationary engines. These shutters greatly improve heater performance and increase engine efficiency and economy. Not only does it constantly maintain higher temperatures reduce engine wear and operating costs, but fuel savings alone are stated to be as high as 16% during winter months. Operation of the shutter differs essentially from other designs. The comparatively sensitive thermostatic element has as its only function the opening and closing of the vacuum line or air



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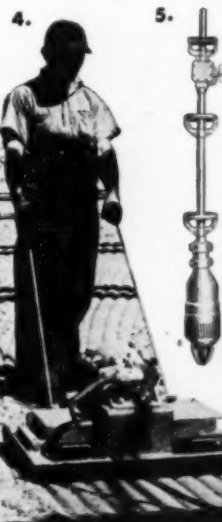
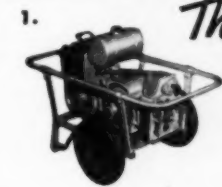
It strikes off to any crown, undercuts at curb or sideform, works right up to and around manholes and other obstructions. With it center construction joints may be eliminated and full widths (up to 30') poured. Requires only two men on widest slab, due to strong tendency to propel itself. It's the only screed that can be rolled back on 4 rollers for second pass. Contractor has only to secure plank cut to proper length and crown to be set for any job. Powered by Jackson 1.25 KVA Portable Power Plant.

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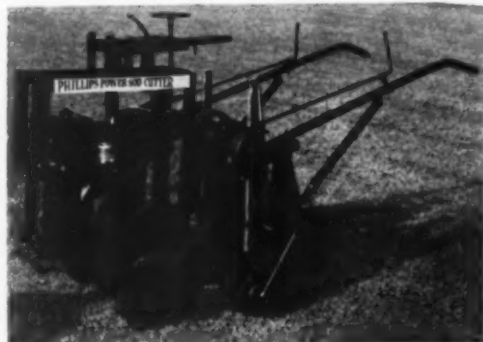
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line. The power required for operating the shutter is supplied by the air cylinder of vacuum cylinder. This manner of application results in long life of the shutterstat, and control of the engine cooling water within high and low limits of 8 degrees. Kysor Heater Co., Cadillac, Mich.

### Gravel Road Stabilization

Who can be sued for an automobile accident caused by loose gravel? This and other subjects concerning unstabilized gravel roads are discussed in a new 8-page bulletin issued by Seaman Motors, Inc. The booklet treats also the cost of stabilization versus the savings possible in lower maintenance and in the elimination of gravel losses. An interesting feature of the bulletin shows a method by which \$150 to \$500 of gravel per mile can be salvaged from shoulders and ditches where it has been "kicked" by traffic. Seaman Motors, Inc., 306 No. 25th St., Milwaukee, Wis.

### Front End Loader

The Getman hydraulic loader is illustrated and described in a 4-page bulletin. This loader has complete hydraulic control with positive bucket positioning at all heights, eliminating waste motions. The loader has a turning radius of 6 ft. 6 in., and a lifting height of 7 ft. 4 in. Specifications as well as a table of operation features are included in the bulletin. Getman Brothers, Manufacturing Division, Benton Harbor, Mich.

### Conveyor Belt Cleaner

The S-A spring-type conveyor belt cleaner is illustrated and described in a bulletin. This cleaner is stated to be one of the most effective methods yet devised for cleaning conveyor belts. Self aligning, spring steel wiper blades, set perpendicular to the belt surface, but diagonal to belt travel, wipe the belt clean and dry as it passes. Spring arms supporting the blades maintain a uniform pressure on the belt and allow blades to ride easily over obstructions such as belt splices. Dribble from the cleaner falls directly into the rear of the discharge chute at the head end of the conveyor. Stephens-Adamson Mfg. Co., P. O. Box 272, Aurora, Ill.



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### Wire Rope and Chain Fittings

A new, revised and enlarged data book, combining valuable engineering information with an extensive catalog of a complete line of wire rope and chain fittings, has been offered by The Thomas Laughlin Co. In addition to presenting detailed working characteristics of each product to remove guesswork in selecting the proper fitting, Laughlin has included tables and charts which make Catalog No. 160 a valuable reference book for engineers, architects, riggers, and safety directors. The catalog lists many new Laughlin products. The Thomas Laughlin Co., Portland 6, Me.

### Filing Cabinets

Kraftbilt filing cabinets for electric logs, strip logs, rolled maps, blueprints and tracings are covered in a 6-page bulletin. Illustrated and described are: an electric well log cabinet, a specially designed 4-drawer job which gives 8-drawer efficiency; a strip log cabinet; a horizontal roll file for filing maps up to 54 in. wide, a vertical roll file with 56 2-in. inside diameter tubes. Ross-Martin Co., 423 East Fourth St., P.O. Box 800, Tulsa 1, Okla.

### Excavators — Cranes

A 4-page circular on the Michigan line of  $\frac{1}{2}$  and  $\frac{3}{4}$  cu. yd. excavators and cranes describes the important features of these machines. Illustrations and descriptions of six models are included; and condensed specifications for these are given. Michigan Power Shovel Co., Benton Harbor, Mich.

### Excavators

A new 32-page bulletin on Marion excavators features a 93-M dragline on its four-color cover, and shows working views of the entire line of Marion machines inside its covers. Starting with the Type 33-M—a  $\frac{1}{4}$  cu. yd. standard shovel—the magazine-size booklet lists condensed specifications and types of service to which the machines can be converted for use—as shovel, dragline, clamshell, crane, backhoe, pile driver, or coal loader—and crane lifting capacities. Marion Power Shovel Co., Marion, O.

### Duo-Way Scoop

Applications of the Mixermobile Duo-Way Scoop are shown in a recent 4-page circular. It is claimed this machine can be used as a loader, tractor, lumber and materials stacker, concrete pouring and materials elevator and heavy materials handler and dozer. Various quick change

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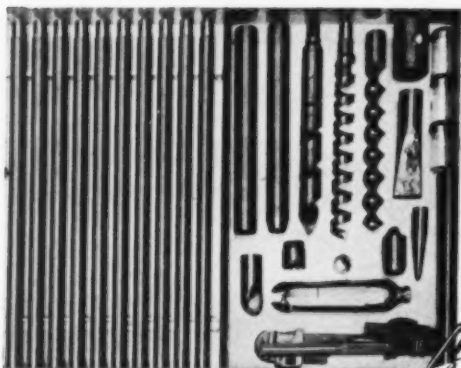
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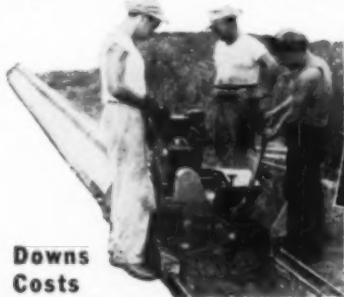
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attachments are illustrated and a line drawing indicates the principal features of the unit. Specifications are given. Mixmobile Manufacturers, 8027 N.E. Killingsworth St., P.O. Box 7527, Portland 20, Ore.

## Engines, Hoists, Compressors, Crushers

Products of Nordberg Mfg. Co., are illustrated and described in a 28-page bulletin. These products include: Diesel engines, radial engines, gasoline marine engines, mine hoists, compressors, crushers, screens, grinding mills, kilns and railway maintenance machinery. Nordberg Mfg. Co., Milwaukee 7, Wis.

## Construction Equipment

The consolidated products and facilities of Pettibone Mulliken Companies are illustrated and described in a 24-page catalog. The companies are Beardsley & Piper, George Haise Mfg. Co., Universal Engineering Corp., Johnston & Jennings, Hammemilla, Inc., and Cleveland Frog & Crossing Co. The products include: Railway track materials, railroad track-kleeners, railroad ballast removers, manganese steel castings, forgings, weldments, heavy machining, materials handling buckets, bucket loaders, speedloaders, aggregate production plants, impact crushers, portable asphalt plants, slurry pumps, diamond alloy dredge pump parts. Pettibone Mulliken Corporation, 4700 West Division St., Chicago 51, Ill.

## Traffic Signs

A 24-page manual contains general information and specifications on Gopher signs. Illustrations are included of regulatory stop signs, highway warning signs, regulatory speed signs, highway warning symbols, exclusion and restrictions signs, regulatory parking signs, highway guide signs, school warning signs, changeable school signs, railroad crossing and identification signs, street name signs, dead end signals and reflector signs. A useful 2-page data chart gives condensed information on all the signs listed. Gopher Stamp & Die Co., Chicago Ave. and Custer St., Saint Paul, Minn.

## Roller Chains and Sprockets

A new catalog of stock roller chains and sprockets, recently announced by Morse Chain Co., gives details on list prices, available sizes of types A, B, and C Morse stock sprockets, and pertinent information on Morse stock roller chain from 1/8 in.

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pitch to 2 in. pitch. Also included are data on drive selection, service factors, installation, and service Morse Chain Co., 7601 Central Ave., Detroit 8, Mich.

### Oil Hydraulic Cylinders

A complete standard line of double acting, single acting, telescopic oil hydraulic cylinders of the heavy duty type, suitable for operating pressures up to 1500 p.s.i., is presented in a 56-page catalog of The Commercial Shearing & Stamping Co. Complete details covering many different types of mountings, style of fittings, ratings, dimensions and mounting data are fully covered. A few typical field applications taken from hundreds of installations of "Commercial" cylinders in use are shown. The Commercial Shearing & Stamping Co., Youngstown 1, O.

### Portable Conveyors

A 12-page illustrated bulletin, issued by Lake Shore Engineering Co., describes its complete line of flight and belt type portable conveyors and under car unloaders for handling sand, gravel, coal, coke and other bulk materials. Brief specification data is given on both electric and gasoline powered models and on hand-move and self-propelled conveyors. Lake Shore Engineering Co., Iron Mountain, Mich.

### Electrical Equipment for Engines

A new, 24-page, well illustrated brochure on the company and its products has been published by The Leece-Neville Co., manufacturers of electrical equipment for diesel, gas and gasoline engines. The brochure outlines the part played by Leece-Neville as a pioneer in this field for over 40 years. The booklet shows typical equipment made by Leece-Neville for buses, trucks, industrial engines, off-highway equipment, passenger cars, rail, marine and aircraft. Included are AC-DC alternator systems, generators, starting motors, hand and magnetic switches, and voltage regulators. The Leece-Neville Co., Cleveland 14, O.

### Map Type Specimen Book

A new booklet of interest to map and chart makers has been announced by Mohnsen-Chicago, Inc., typographers. It is the Mohnsen Trans-Adhesive (reg.) Map Type Specimen Book, the first ever published. The map type book shows examples of well over 100 styles of type. Anyone who has had to apply printed or lettered place-names to maps, knows how slow and te-

### BOOKS

**AUTOMOTIVE AND CONSTRUCTION EQUIPMENT**—By C. W. Lindgren. Written to provide instruction to transportation, civil engineering and military students. This book deals with the driver, mechanic, shop supervision, management and other fundamental information related to automotive transportation, shipping and loading of goods. The author identifies basic principles of automotive and construction equipment management and ownership, and attempts to show that investment can be justified only by efficiency and carrying full loads. Useful for those who are not fully acquainted with capacity of trucks, loading equipment, shovels, cranes, tractors, scrapers, bulldozers, motor graders, rollers, trenching machines, paving and crushing and aggregate washing equipment. 290 pages, 120 sketches. \$4.50. Jacksonville Publishing Co., Box 3620, Washington 7, D. C.

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73 ft. 125 ft. 185 ft. 230 ft. 365 ft. 600 ft. deliver 15% to 25% more air at lowest cost per cubic foot of any compressors on the market, to run today's tools at their full efficiency, greatly increasing your production with the same men and tools.

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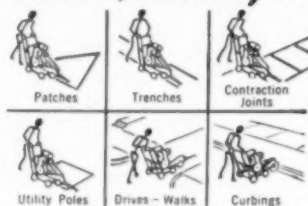
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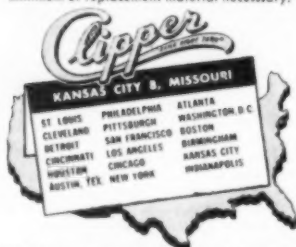


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dious this job can be. Monsen map type is designed to simplify this problem. It eliminates the need for costly hand lettering, and avoids the complications of applying small typographic detail with paste or liquid cement. The book explains how place-names, descriptions, numerals, symbols, etc., are printed to your own specifications on sheets of Monsen trans-adhesive. These are crystal-clear acetate sheets, backed with a pressure-sensitive adhesive. Monsen-Chicago, Inc., 22 East Illinois St., Chicago 11, Ill.

#### Hoist for Long Wheelbase Trucks

An advanced type of hoist for long wheelbase trucks is described in a new illustrated bulletin of Hercules Steel Products Corporation. This hoist, the KDLL, incorporates the exclusive Hercules "Center-Lift" design. Reported advantages are extra lifting power, smoother operation, and longer service life. The KDLL Hoist is for bodies 9 and 10 ft. long with capacities to and including 3 cu. yds., also for 12- and 14-ft. platforms. Hercules Steel Products Corporation, Galion, O.

#### Electric Car Puller

A new catalog, released by American Hoist and Derrick Co., describes their complete line of electric car pullers and provides many suggested uses for this versatile piece of equipment. There are three American electric car puller types—capstan, drum and continuous rope. The catalog describes each one, their applications and gives specifications as well. American Hoist and Derrick Co., St. Paul 3, Minn.

#### Effect of Dew on Signs

Research to discover how dew dims traffic signs at night is described in a new four-page report available from Minnesota Mining and Manufacturing Co. The report includes graphs which show the effect of dew on the night-time readability of six different types of standard traffic signs. Also shown in the graphs is the effect of short and long periods of dew on the different signs. Minnesota Mining and Manufacturing Co., Fawcett St., St. Paul 6, Minn.

#### Electrical Measuring Instruments

Information on "how to select" electrical measuring instruments is provided in a 30-page instrument booklet available from the Westinghouse Electric Corpora-

#### RUBBER-ASPHALT ROADS

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tion. Seven basic selection factors are explained; types of instruments available in each major classification are listed on a full-page check chart; and, four typical selection problems are solved to help the reader make his selection. Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa.

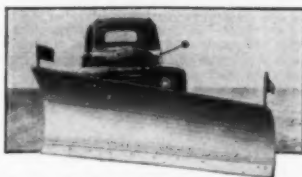
### Protective Hats

A new illustrated booklet on protective hats points out the vital importance of adequate head protection by listing eight representative examples from the many in MSA files where workers have escaped serious injury and even death when struck by falling objects while wearing Skullgards. A section of the booklet is devoted to the care of the MSA skullgard. Proper precautions which prolong the life of the protective hat are shown. Important design features of a protective hat are also discussed. Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh 8, Pa.

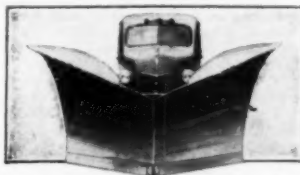
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A new catalog and engineering manual for the Gaco rubber lined pipe joint system. This comprehensive manual illustrates how the system eliminates the cost and time consuming methods of pre-engineering and pre-fabricating sections of rubber-lined pipe. The new Gaco joints may be installed in the field. The manual contains a complete list of fittings and specifications for rubber-lined pipe stock piles, plus a corrosion list to which Gaco gaskets and linings are resistant. Gates Engineering Co., Box 1711, Wilmington, Del.

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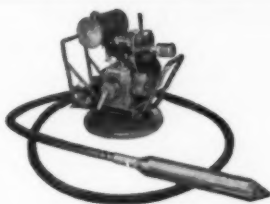
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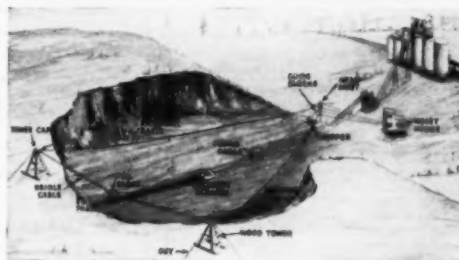
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## Selection of Engineering Irons

New 28-page basic reference bulletin, compiled primarily for design engineers, presents the many valuable characteristics of modern nickel cast irons and illustrates their broad acceptance throughout industry. 50 illustrations indicate wide industrial usage in all sizes and shapes. 27 useful tables, charts and photomicrographs show how through the use of nickel, alone or in combination with other alloying elements, the engineering properties of cast iron can be controlled to meet almost any reasonable combination of service requirements. International Nickel, New York 5, N.Y.

## Plastic Rock Flooring

A new 8-page, 2-color brochure on plastic rock flooring announced by United Laboratories, Inc., contains a combination of information on how and where to apply this flooring as well as certain technical data about the product itself. Many typical flooring applications are illustrated. Highlighted in the literature is the use of plastic rock for resurfacing traffic areas subjected to heavy traffic both foot and wheel. United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, O.

## Threaded Bars

New bulletin titled "Ryerson Threaded Bar Service" gives data on size range, lengths, kind of threads, bending, and types and finishes of steel bars that are furnished threaded. The bulletin also illustrates some of the accessories that are furnished including turnbuckles, nuts, washers and tank lugs. Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill.

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Two Allis-Chalmers HD-5B tractors, completely rebuilt, guaranteed.  
Worthington 315' compressor on steel, good condition.

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3 16 yd. LaPlant-Chbate Cable Scrapers.

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New Bros. Hydraulic Bulldozer, Complete, 8 1/2 Caterpillar D4 Tractor. \$950.00  
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Caterpillar Model 50 Tractor with Hydraulic Bulldozer \$1,800.00  
Int. Harvester Power Unit Model PA-50 rebuilt \$650.00  
Caterpillar D-4 with hillift. \$2,000.00

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- 2 Euclid twin powered scrapers with GM diesel engines of 18 truck and 24 cu. yd. heaped capacity—Excellent condition—Price each \$37,500.00
- 3 Gardner-Denver 300 C.F.M. Model 150 skid mounted compressors w/Caterpillar D-13000 engines—Excellent condition—Price each 1,500.00
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WOOLDRIDGE "TERRACOBAS" with Cummins 200 H.P. Diesel. Four units immediately available. Excellent Condition.

LIMA Model 750 Dragline. D-17000 Caterpillar Engine. Excellent Condition.

BUCYRUS-ERIE Model 38-B Dragline D-13000 Caterpillar Engine. Like New.

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**MACHINERY COMPANY, Inc.**  
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- Shovel Front for H.W.-6
- 2—Super C. Tournapole (like new)
- 2—Lorain 520 Shovels
- 1—Northwest 88-D Shovel

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**A-1 USED EQUIPMENT**

- EUCLIDS** 3 Models WFSY-13 Yd. Water Level Bottom Pump—General Motors 671 Diesel June 19, 1950. 2—Euclid Models GRT-13 Yd. Water Level Bottom Pump—Cummins Diesel Engines.
- DRAGLINE** Northwest Model 98 Dragline—80 Ft. Boom—3 Yd. Hendrix Dragline Buckets—fair-ember 1949. Excellent condition.
- DRAGLINE** Northwest Model 25-3 1/2 Yd. Capacity, Serial 18231—40 Ft. Boom—fairleads—28'—trails—powered by Caterpillar D4600 Diesel engine, 4 Years old—excellent condition.
- SHOVEL** Northwest Model 25-3 1/2 Yd. Capacity—Serial 11817—powered by Caterpillar Model 310 Diesel Engine—34'—trails. Standard sticks & Boom, 2 years old—excellent condition.
- SHOVEL** Marion Model 331-5 1/2 Yd. Dipper—powered by Caterpillar D4600—Diesel Engine—2800 hrs.—Machine new, May, 1949. Excellent condition.
- SHOVEL & DRAGLINE** Koshing Model 608-1 1/2 Yd. capacity—80 Ft. Boom, Fairleads—powered by Caterpillar D13000 Diesel engine—extra coal dipper. New—January 1947. Excellent condition.
- SHOVEL & DRAGLINE** Ray City Model 30-1 1/2 Yd. capacity—32 Ft. Boom—Fairleads—Tagline—3 1/2 Yd. Dragline Buckets—powered by International gasoline engine—Very good operating condition.
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KNOW-HOW**

- 1 INTERNATIONAL TD-9, 60" tread, 16" shoes, Bucyrus-Erie Bulldozer, front pump. Is guaranteed.
- 2 IHC TD-14 tractors, 74" tread, 18" shoes, Bucyrus-Erie Bulldozer, Reconditioned and guaranteed.
- 1 IHC TD-18 tractor, 74" tread, 20" shoes, Bucyrus-Erie Bulldozer. Reconditioned and guaranteed.

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All miscellaneous parts with equipment.  
To party buying all equipment a \$100,000.00 contract job. A good buy to anyone who wants the equipment cheap. Contact:

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- 20 WHEEL TANDEM TRAILER with 16 tires on back, 4 on front.
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KOEHRING Model 605 shovel, dragline combination. "Caterpillar" D-13000 power, 4 years old \$25,000.00

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PIONEER 1536 roller bearing jaw crusher, skid mtd. \$4,500.00

MARION Model 331 3/4 yd. shovel, 2 years old \$14,000.00

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Shovels, Draglines, Cranes, 1 1/2 to 4 yd. (10).  
Pioneer 305W sand washing plant, 1948 model.  
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Two Bucyrus Erie 38B's, 1948: one with Cat diesel motor, shovel front only; the other, General Motors diesel with 65 foot crane boom, fair lead and counterweight, 1 1/2 yard shovel front.

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1944 Model 6 Northwest with 2 yard shovel front and 1 1/2 yard box boom back hoe.

L P scraper, 12 to 15 yd.

Susser McKean scraper 10 to 12 yards—\$2,500.

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D8 hydraulic bulldozer, new pins, bushings, sprockets and idlers, 2 drum power control unit—\$9,500.

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Allis Chalmers pump, 2" x 1 1/2, 1 cylinder Wisconsin motor, in crate, new—\$195.

Winch with 6 cylinder Hercules motor, new, in crate, motor will fit 3/4 yard shovel.

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Allis-Chalmers MD-14 Tractor with bulldozer.

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All of this equipment is now operating and will be available in about two weeks, and can be inspected in the vicinity of Dover, Delaware.

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1948 KB-8 International tractors  
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40 ton low bed trailer solid tires

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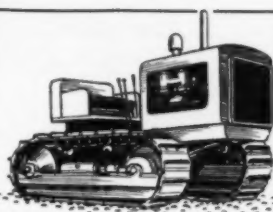
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2000 lbs. Ingersoll-Rand air hoist, size MU.  
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 Ingersoll-Rand compressor - Model UD 18A equipped with an International Diesel engine. This equipment used only three months. Practically new. Will sacrifice at low price.

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- 7 Caterpillar D7
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- 4 Allis-Chalmers HD10

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- 3 Inley K12 Backhoes - 1/2 yd.
- 1 Byers 83 Shovel - 1/2 yd.
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The above equipment used only 4 1/2 months and  
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One-Bucyrus-Erie Model D2 Diesel Crane 45 ft. boom  
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"Caterpillar" D6 equipped w/ LaPlant-Chaste  
angle dozer. This tractor is being overhauled  
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Engine & transmission are in excellent con-  
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"Caterpillar" D2 w/ radiator & crankcase guards.  
This machine has not had any hard use. Is in  
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Late model 2 years old  
Perfect Condition, Like New  
Sacrifice \$7,500

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- 1-315 CFM Worthington D8800 Cat. Engine, Pneu-  
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DANVILLE, KENTUCKY

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Caterpillar 12 Motor Grader	\$9,250.00
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Caterpillar 70 Scraper like new	\$6,850.00
Caterpillar 60 Scraper like new	4,850.00
Caterpillar D4 Miller TU Series	\$8,750.00
Caterpillar D2 With Hyd. Dozer	\$2,150.00
Caterpillar D2 Tractor	\$1,350.00
Caterpillar D2 Tractor	\$750.00
Galion 101 Tandem Diesel Grader	\$2,150.00
American 108 1948 Diesel Grader	\$1,750.00
Le Tourneau L.P. Scraper 18.00x24 Tires	\$3,250.00
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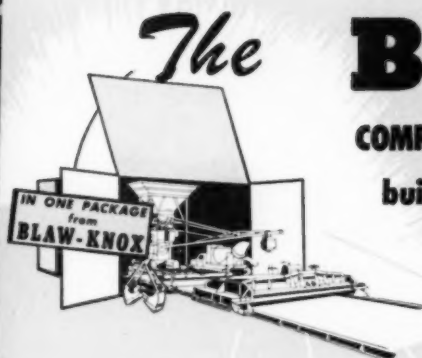
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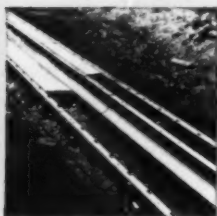
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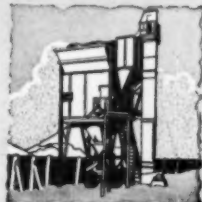
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